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Paul Ishikawa ..... Poster Coordinator

Cover Photo: Wasatch Front, Mike Morrison
RS 2004 Logo: Thore (TC) Christensen

Welcome to the USDA Forest Service's Tenth Biennial Remote Sensing Conference, RS 2004. The conference theme is "Remote Sensing for Field Users." The presentations and posters emphasize remote sensing and geospatial applications and techniques that have benefited the field user. During the conference you will have the opportunity to learn about successful remote sensing applications covering a wide range of resource management topics. There are presentations, posters, and vendor displays from many federal and state land management agencies, as well as NASA, international groups, universities, and private corporations. You are a vital ingredient in the success of the conference. Take the time to introduce yourself to other conference attendees, share your experiences, and learn from others.

We would like to thank our co-sponsors, the Intermountain Region, NASA, and DIGIT Lab and also the Conference Services from the University of Utah for all their help. We would also like to acknowledge the vendors for their contribution to the refreshments during breaks.

Please remember to complete the conference evaluation form included with your registration materials. Drop it off at the registration desk in the Cottonwood room. Extra copies of the evaluation form are available at the registration desk. Tell us what you liked, and what you would like to see different at RS 2006.

Thanks for attending. Enjoy the conference and downtown Salt Lake.

The RS 2004 Conference Organizing Committee

Conference Sponsors

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Remote Sensing Applications Center

The Remote Sensing Applications Center (RSAC) is a National Service Center of the USDA Forest Service – Engineering Staff. RSAC's mission is to provide technical support to Forest Service resource specialists and managers in the use of remote sensing, image processing, GIS, and related geospatial technologies for all resource applications.

RSAC is co-located with the Forest Service Geospatial Service and Technology Center (GSTC) and the USDA Aerial Photography Field Office (APFO) in Salt Lake City, UT.

RSAC Programs and Services

- Training
- New Technology Evaluation
- Applications Development
- Technical Support
- Operational Support for Fire
- Cooperative Projects
- Data Acquisition
- Liaison with other Remote Sensing Programs

USDA Forest Service - RSAC
2222 W 2300 S
Salt Lake City, Utah 84119
801-975-3750

Tom Bobbe, Center Manager

www.fs.fed.us/eng/rsac
fsweb.rsac.fs.fed.us

Intermountain Region

The Intermountain Region of the Forest Service encompasses nearly 34-million acres of National Forest System land. The region consists of 13 National Forests and one National Grassland, administered by Forest Supervisors in Utah, Nevada, southern Idaho and western Wyoming.

Four major geographic provinces come together to form the Intermountain West. They include the Great Basin, Colorado Plateau, Middle Rocky Mountains and the Northern Rocky Mountains. These provinces are the reason for the tremendous diversity of landscapes and ecosystems within the Intermountain Region.

Intermountain Region National Forests

- Ashley
- Boise
- Bridger-Teton
- Caribou-Targhee
- Dixie
- Fishlake
- Humboldt-Toyiabe
- Manti-LaSal
- Payette
- Salmon-Challis
- Sawtooth
- Uinta
- Wasatch-Cache

USDA Forest Service
Intermountain Region
324 25th Street
Ogden, Utah 84401
801-625-5306

Jack Troyer, Regional Forester
Roberta Quigley, Geospatial Team Leader

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NASA

NASA's Vision to improve life here starts with the Earth Science Enterprise's study of planet Earth from space. We are deploying and operating the first comprehensive constellation of Earth-observing research satellites designed to reveal interactions among Earth's continents, atmosphere, oceans, ice, and life. These interactions produce the conditions that sustain life on earth. Data and information from our satellites enable researchers to understand the causes and consequences of global change and to provide governments, businesses, and citizens with the information to make decisions and improve our quality of life.

Results from NASA Earth science research contribute to information solutions that enhance economic and homeland security using improved predictions of weather, climate, and natural hazards. NASA provides the research-quality, Earth-observing systems and Earth science models that advance the Nation's ability to understand and protect Earth's dynamic system. By working through partnerships with NOAA, USFS, the U.S. Geological Survey (USGS), and other Federal agencies, we improve essential services such as tracking hurricanes, assessing crop health and productivity, and evaluating forest fire risks, aviation safety, energy forecasts, and the potential for the climate-driven spread of infectious disease.

NASA Headquarters
300 E Street SW
Washington, DC 20546
202-358-0000

Sean O'Keefe,
NASA Administrator

www.nasa.gov

DIGIT Lab

The DIGIT Lab has a three-fold purpose: research, instruction, and technology transfer (public service).

The DIGIT Lab was established in 1987 and is an auxiliary facility of the University of Utah Department of Geography. They operate within the University's research infrastructure and provide support for both theoretical and applied geographic information analysis and application development.

The computing facilities at the DIGIT Lab provide instructional support for courses in the science and application of GIS, remote sensing, and spatial data analysis.

The DIGIT Lab also supports faculty research in the Department of Geography as well as other departments at the University of Utah.

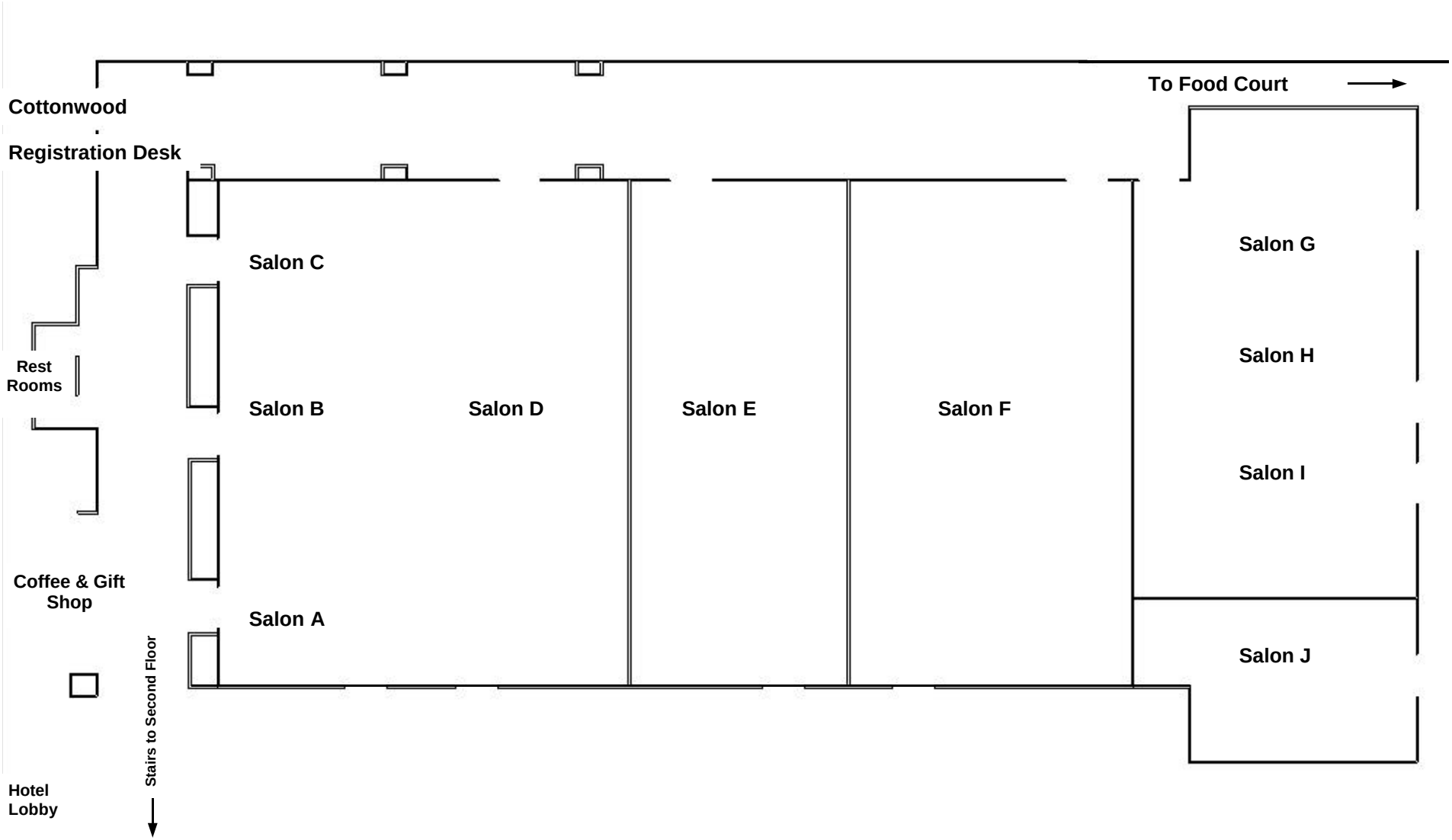
DIGIT Lab
University of Utah
260 S Central Campus Dr Rm 270
Salt Lake City, UT 84112
801-581-3612

Adam Sobek, Director

www.digit.utah.edu

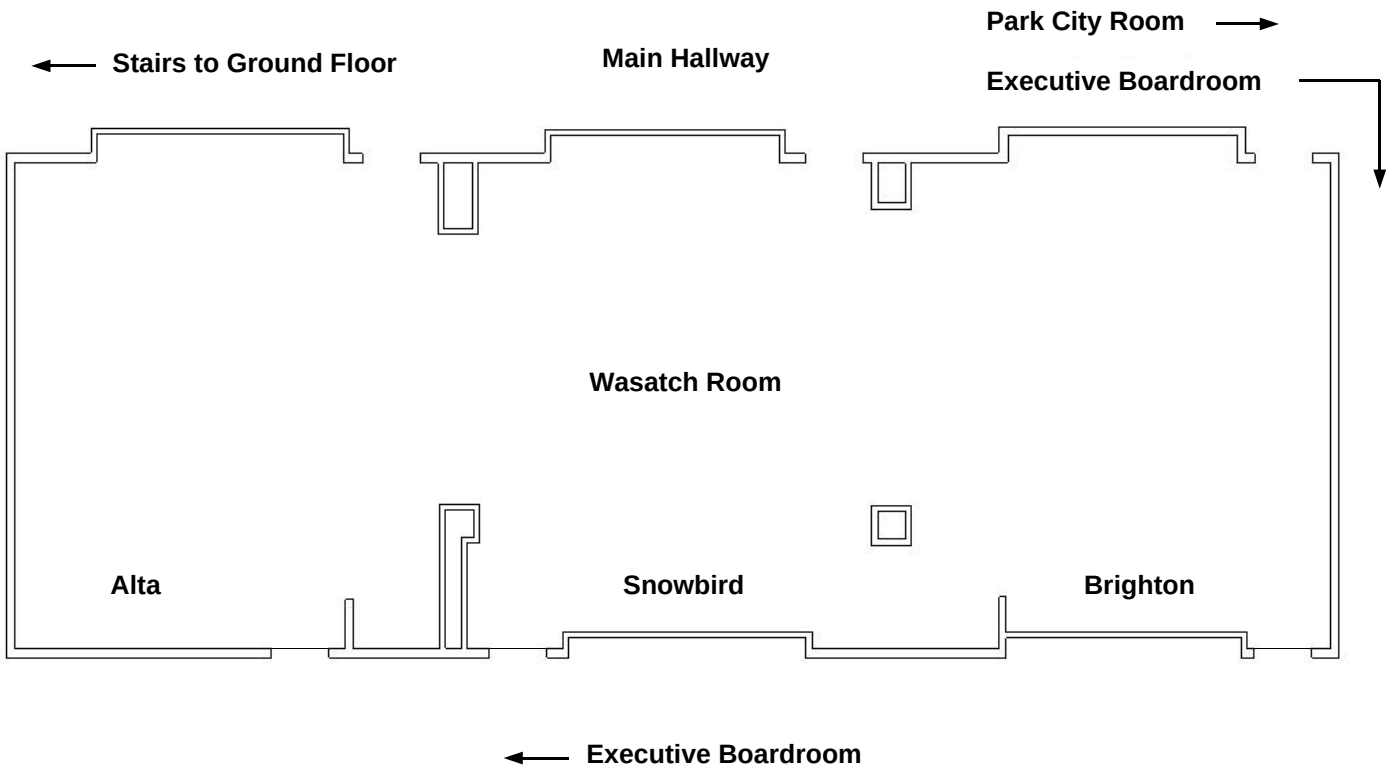
Floor Plan

Ground Floor



Second Floor

Floor Plan



Demos

Thursday April 8, 2004 Wasatch Room

An open forum where you can ask questions or see demonstrations on an individual basis. You can preview software products and applications, anytime from 8:00—11:30 and 1:00—3:00.

Multi-stage Sampling for Forest Inventory using GeoTools
Dr. Gregory T. Koeln — Earth Satellite Corporation, Rockville, MD

Using MODIS Data for GIS Projects
John Smith, John Norton — USDA Forest Service, RSAC, Salt Lake City, UT

Implementing a Remote Sensing Program to Meet Ranger District Level Needs
Karen Owens, Tony Guay — USDA Forest Service, RSAC, Salt Lake City, UT

Utilizing GEOBOOK in the Forest Plan Revision Process: Improving Communication and Reducing Cost
Julie Coen — Space Imaging, Salt Lake City, UT

EarthWhere - On-demand Spatial Data Provisioning of Raster Data sets
Bob Harney — Geospatial Solutions Group, SANZ, Inc., Castle Rock, CO

Wildfire and Management Remediation Planning Utilizing Second Generation Orthos
Dale R. Johnson — Positive Systems, Inc., Whitefish, MT

What's new in ArcGIS9
Tim Clark, Bentley Patterson — ESRI, Broomfield, CO

Lecia Photographymetry Suite in ERDAS Imagine
Joe Mostowy, Suzie Noble — Leica Geosystems GIS and Mapping, Englewood, CO

TEUI Toolkit
Haans Fisk — USDA Forest Service, RSAC, Salt Lake City, UT

The Environment Creation Tool (ECT)
Randy Toth, Arvind Sekar — Evans & Sutherland, Salt Lake City, UT

GeoExpress with MrSID
Jim Deilschneider — LizardTech, Seattle, WA

Resource Management and Geospatial Tools Conference

April 18-22, 2005
Phoenix, Arizona
Sheraton Crescent Hotel

A joint conference with:
Bureau of Land Management
Forest Service
Arizona State University

THEME - The conference will concentrate on resource management applications of GIS and other Geospatial sciences. Presentations will be useful to resource managers as well as geospatial professionals.

NETWORKING - This will be an excellent opportunity to communicate and learn with personnel from our sister resource management agency. Find the energy in synergy.

TRAINING - Numerous hands on training sessions will be provided at the near by BLM National Training Center (for both beginners and advanced skill levels).

VENDORS - Enlarged and enhanced vendor displays – More companies, more new tools, more new ideas.

Put it on your calendar.
See you there!!

Daily Agenda

Monday April 5, 2004
8:00 AM—5:15 PM

Time	Salon E-F	Salon A-D	Cottonwood
8:00 ---- 10:00			Registration Opens
10:00 ···11:30		Poster & Vendor Setup	
11:30 ·····1:00	**Lunch**		
	Opening Session I Moderator: Chuck Dull	Poster & Vendor Session	
	Mike Morrison Program Chair Welcome and Remarks		
1:00 ·····1:30	**Tom Thompson** Deputy Chief, National Forest System		
1:30 ·····2:00	**Steve Solem** Director, Intermountain Region Planning, Appeals, & Litigation Team		
2:00 ·····2:30	**Joel Frandsen** Utah State Forester		
2:30 ·····3:00	**Ed Sheffner** Program Manager, Earth Science Applications Division - NASA		
3:00 ·····3:30	**Break**		
	Opening Session II		
3:30 ·····4:00	**Jim Hubbard** Colorado State Forester		
4:00 ·····4:30	**Rick Forster** Assistant Professor, Department of Geography, University of Utah		
4:30 ·····5:00	**Dennis Goreham** Manager, Utah Automated Geographic Reference Center, Utah's Data Coordination		
5:00 ·····5:15	**Dr Fritz Hasler** Leader, NASA Goddard Earth Science Visualization and Analysis Laboratory NASA ETheater—Spectacular Visualization		

Tuesday April 6, 2004
8:00 AM—1:00 PM

Daily Agenda

Time	Salon E	Salon F	Wasatch	Salons A-D	Cottonwood
	Plenary Session Moderator: Tom Bobbe				
8:00------ 8:30	**Ed Harne** Geographic Sciences Coordinator, Bureau of Land Management			Poster & Vendor Session	Registration
8:30------ 9:00	**Paul Greenfield** National Remote Sensing Program Manager, Forest Service				
9:00------ 9:30	**Glenn Bethel** Remote Sensing Advisor, United Stated Department of Agriculture				
9:30-----10:00	**Break**				
	Forest Health Moderator: Kim Rivard	**Landfire** Moderator: Don Patterson	**New Technology** Moderator: Roberta Quigley		
10:00 ···10:30	**Using multi-frame tools to assess pinyon mortality in the southwestern United States** Presenter: Jim Ellenwood Forest Health Technology Enterprise Team, Fort Collins, CO	**Current findings of the interagency LANDFIRE landscape modeling and mapping prototype project** Presenter: Tracey S. Frescino USDA Forest Service, RMRS, FIA, Missoula, MT	**LiDAR - The Future of Remote Forest Assessments?** Presenter: David L. Evans Department of Forestry, Mississippi State, MS		
10:30 ···11:00	**Using Remotely Sensed Data for Tamarisk Identification and Mapping** Presenter: Jennifer Stefanacci Parallel, Inc./USGS, Denver, CO	**Fires 2003 – Mapping vegetation and fuel characteristics in support of the Northern Rockies Multiple Agency Coordination Group** Presenter: Donald Long USDA Forest Service, RMRS, Fire Sciences Lab, Missoula, MT	**Extracting Natural Geospatial Features from LiDAR** Presenter: Matt Morris Visual Learning Systems, Inc., Missoula, MT		
11:00 ···11:30	**Multi-scale analysis of aerial photography to detect sulfur cinquefoil in interior Pacific Northwest rangelands** Presenter: Bridgett J. Read USDA FS Pacific Northwest Research Station, La Grande, OR	**LANDFIRE Project: Vegetation Mapping for Natural Resources Applications** Presenter: Jeff Eidenshink USGS, Sioux Falls, SD	**The use of airborne LiDAR and Aerial Photography in the estimation of individual tree heights in British forestry** Presenter: Juan C. Suarez Forest Research, Roslin, United Kingdom		
11:30 ·····1:00	**Lunch**				

Daily Agenda

Tuesday April 6, 2004
1:00—3:00 PM

Time	Salon E Forest Health Moderator: Jim Ellenwood	Salon F NASA Track Moderators: Vince Ambrosia, Rob Sohlberg	Wasatch New Technology Moderator: Bill Belton	Salons A-D	Cottonwood
1:00------ 1:30	**Digital Aerial SketchMapping: A Method for Mobile GIS Data Collection** Presenter: Mike McWilliams Oregon Dept of Forestry, Insect and Disease Lab, Salem, OR	**Collaborative Efforts in R&D and Applications of Imaging Wildfires** Presenter: Vincent G. Ambrosia California State University - Monterey Bay, NASA-Ames, Moffett Field, CA	**Accessible Technology to Effectively Orthorectify Digital Aerial Photos and Applying Value Addition Tools** Presenter: Kevin Megown USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT	Poster & Vendor Session	Registration
1:30------ 2:00	**Communities at Risk of Wildfire on Alaska's Kenai Peninsula Use Remote Sensing and Mobile GIS Tools on the ground.** Presenter: Marvin Rude Kenai Peninsula Borough Spruce Bark Beetle Mitigation Program, Soldotna, AK,	**Bi-spectral Infrared Detection Mission for Innovative Fire Observation** Presenter: Dieter Oertel German Aerospace Center (DLR) Optical Information Systems, Berlin, Germany	**Application of orthorectified aerial photos in feature analyst to understand burn intensity.** Presenter: Geno Bassette USDA Forest Service, Northern Region, Missoula, MT		
2:00------ 2:30	**Using the Tasseled Cap Transformation to Identify Change in the Missouri Ozark Forests** Presenter: Ronnie Lea Missouri Resource Assessment Partnership, Columbia, MO	**Use of MODIS for Active Fire Detection and with EO-1 for SensorWeb Applications** Presenter: Robert Sohlberg University of Maryland, College Park, MD	**Objective Landslide Detection and Surface Morphology Mapping Using High-Resolution LiDAR** Presenter: Jim McKean USDA Forest Service, Rocky Mountain Research Station, Boise, ID		
2:30------ 3:00	**Break**				

Tuesday April 6, 2004
3:00—7:30 PM

Daily Agenda

Time	Salon E Utah Track	Salon F NASA Track	Wasatch GPS Applications	Salons A-D	Cottonwood
3:00 ·····3:30	**Land Cover Mapping for the Southwest Regional Gap Analysis Project** Presenter: John Lowry RSGIS Laboratory, College of Natural Resources, Logan, UT	**Wildfire Airborne Sensor Program (WASP): A new wildland fire detection and mapping system** Presenter: Donald McKeown Rochester Institute of Technology, Rochester, NY	**Utilization of Personal Data Assistants Linked to GPS Receivers to Resurvey Red-Cockaded Woodpeckers on the Osceola National Forest** Presenter: Carl J. Petrick USDA Forest Service, National Forests in Florida, Tallahassee, FL	Poster & Vendor Session	Registration
3:30 ·····4:00	**Comparing ASTER DEMs with GPS elevations** Presenter: Andrew Ford University of Utah, Salt Lake City, UT	**Geostationary Satellite Fire Monitoring Using the Wildfire ABBA** Presenter: Elaine Prins NOAA/NESDIS Advanced Satellite Products Team, Grass Valley, CA	**GPS Mapping using WindowsCE·Data collector with background maps** Presenter: Carma Ingram Monsen Engineering, Salt Lake City, UT		
4:00 ·····4:30	**Snowmelt Runoff Modeling using Active Microwave Remote Sensing in the Arctic** Presenter: Angira Baruah Dept. of Geography, University of Utah/ USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT	**Continuing a Tradition of Excellence - Thermal Infrared Wildfire Detection and Mapping by the National Infrared Operations (NIROPS) Group** Presenter: Steve Trulove USDA Forest Service, Region 4, Boise National Forest, Boise, ID	**Global positioning system accuracy under varying forest canopy conditions** Presenter: Jason A. Cole State University of New York College of Environmental Science and Forestry, Syracuse, NY		
4:30 ·····5:00	**Analyzing the Effect of Increased Impervious Surfaces on Water Quality in Utah Lake** Presenter: Tiana Davis BYU Geography Dept, Provo, UT	**Airborne Data Systems' support during the 2003 Montana wildfire season** Presenter: Jay Fuhr Airborne Data Systems, Wabasso, MN	**Accurate velocity estimates from inaccurate GPS data** Presenter: Norm Cimon USDA Forest Service, PNW Experiment Station, La Grande, OR		
5:00 ·····7:30				**Poster & Vendor Ice Breaker**	

Daily Agenda

Wednesday April 7, 2004
8:00 AM—1:00 PM

Time	Salon E Resource Inventory Moderator: Mark Flood	Salon F Active Fire Moderator: Bill Krausmann	Salon G-I Data Warehousing Moderator: Mark Nelson	Salons A-D	Cottonwood
8:00------ 8:30	**The Southwestern Region Mid-Scale Existing Vegetation Mapping Project** Presenter: Thomas Mellin USDA Forest Service, Southwestern Region, Albuquerque, NM	**Ground-based Thermal Observations of the Black Mountain 2 Fire in Montana, 2003** Presenter: Patrick H. Freeborn USDA Forest Service, Rocky Mountain Research Station, Missoula, MT	**An online system for the retrieval of digital imagery** Presenter: Greg C. Liknes USDA Forest Service, North Central Forest Experiment Station, St. Paul, MN	Poster & Vendor Session	Registration
8:30------ 9:00	**A Change Detection System for Natural Resource Applications** Presenter: Matt Morris Visual Learning Systems, Inc., Missoula, MT	**Improved Fire Temperature Estimation Using Constrained Spectral Unmixing** Presenter: Ambrose Ononye Rochester Institute of Technology, Rochester, NY	**FSGeodata - The Forest Service Geospatial Data Clearinghouse** Presenter: Matt Sheehan USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT		
9:00------ 9:30	**USDA Forest Service Mapping Standards for Existing Vegetation - A Test of the Base Level Standards** Presenter: Brian Schwind USDA Forest Service, Pacific Southwest Region, Sacramento, CA	**Innovative Tactical Wildfire Assessment Using High Resolution Satellite Imagery** Presenter: William Whatley NCDC, Colorado Springs, CO	**Web-Based Geospatial Data Ordering for Wildland Fire Support** Presenter: Jeff L. Sloan USGS - Rocky Mountain Mapping Center, Denver, CO		
9:30-----10:00	**Break**				
			FIA		
10:00---10:30	**Digital Mylar: A Tool to Attribute Vegetation Polygon Features over High Resolution Imagery** Presenter: Jess Clark USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT	**Phoenix - The New Digital Fire Detection/Mapping Platform** Presenter: Woody Smith USDA Forest Service, NIFC, Boise, ID	**The National FIA Remote Sensing Band: Current projects to map the Nation's forests.** Presenter: Dennis M. Jacobs USDA Forest Service, SRS, Forest Inventory & Analysis, Starkville, MS		
10:30---11:00	**Updating Landtype Association Mapping Techniques in Region 6 Using the Terrestrial Ecological Unit Inventory (TEUI)-Geospatial Toolkit** Presenter: D.R. Ufnar Dept. of Crop and Soil Sciences, Washington State University, Pullman, WA,	**Infrared Field User's Guide and Vendor Listings** Presenter: Thomas Zajkowski USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT	**How does MODIS Imagery Correlate with USDA-Forest Service FIA Plot Data?** Presenter: Michael Hoppus USDA Forest Service, Northeastern Research Station, FIA, Newtown Square, PA		
11:00---11:30	**Overview of the 2001 National Landcover Database and its Applications in Forestry** Presenter: Collin Homer EROS Data Center, Sioux Falls, SD	**High Accuracy Perimeter & Thermal Maps Delivered to the Fire Line in Real Time.** Presenter: Timothy Ball Fireball Information Technologies, LLC, Reno, NV	**Optimal k-nearest neighbor prediction of forest stand volume in the Northeast USA** Presenter: Raymond L. Czaplewski USDA Forest Service, RMRS, Fort Collins, CO		
11:30---- 1:00	**Lunch**				

Wednesday April 7, 2004
1:00—3:00 PM

Daily Agenda

Time	Salon E Resource Inventory Moderator: Renee Jacokes	Salon F Pre-Fire Moderator: Ken Brewer	Salon G-I FIA Moderator: Dennis Jacobs	Salons A-D	Cottonwood
1:00 ·····1:30	**Fuzzy recoding for deconflicting land cover classification** Presenter: Suzie Noble Leica Geosystems GIS & Mapping, LLC, Englewood, CO	**Mapping Relative Fire Regime Condition Class for the Western United States** Presenter: James Menakis USDA Forest Service, Fire Effects Unit, Fire Science Laboratory, RMRS, Missoula, MT	**Mapping forest land proportion from MODIS Vegetation Continuous Fields data.** Presenter: Mark D. Nelson USDA Forest Service, North Central Forest Experiment Station, FIA, St. Paul, MN	Poster & Vendor Session	Registration
1:30 ·····2:00	**Land cover classification in the Caribbean using machine learning techniques** Presenter: Steve Schill The Nature Conservancy, Richmond, UT	**Improving the conterminous U.S. greenness data set for fire danger monitoring** Presenter: Jeff Eidenshink U.S. Geological Survey, Sioux Falls, SD	**Spatial Control of Legacy FIA Ground Plot Data in Interior Alaska** Presenter: Ken Winterberger USDA Forest Service, Pacific Northwest Research Station, FIA, Anchorage, AK		
2:00 ·····2:30	**Automated Delineation and Attribution of Forest Stands From High-Spatial Resolution Remote Sensing Data** Presenter: Norm Roller Marshall and Associates, Inc., Olympia, WA	**Evaluating the ASTER sensor for mapping and characterizing forest fire fuels in northern Idaho** Presenter: Michael Falkowski University of Idaho, Moscow, ID	**Forest Type Mapping of Arizona, New Mexico, and Wyoming** Presenter: Bonnie Ruefenacht USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT		
2:30 ·····3:00	**Break**				

Daily Agenda

Wednesday April 7, 2004
3:00—5:00 PM

Time	Salon E Resource Inventory	Salon F Pre-Fire	Salon G-I FIA	Salons A-D	Cottonwood
3:00 ·····3:30	**Using IKONOS imagery to distinguish five hardwood trees in south-central Indiana** Presenter: Dale R. Weigel USDA Forest Service, North Central Research Station, Bedford, IN	**The use of Quick Bird Satellite Imagery to define the Wildland Urban Interface and determine hazardous fuel treatment priorities** Presenter: Skip Edel Colorado State Forest Service, Denver, CO	**Small area estimation in forests affected by wildfire** Presenter: Gretchen Moisen USDA Forest Service, Rocky Mountain Research Station, FIA, Ogden, UT	Poster & Vendor Setup	Registration
3:30 ·····4:00	**The use of MODIS products in a geospatial decision support tool for rangeland monitoring** Presenter: Willem van Leeuwen University of Arizona, Tucson, AZ	**Enhancement of a Firewise program with geospatial data, assessment, and analysis** Presenter: Tom Eiber Minnesota Division of Forestry, Fire Management Section, St. Paul, MN	**The Uses of Regression-trees in Remote Sensing** Presenter: Bonnie Ruefenacht USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT		
4:00 ·····4:30	**Using QuickBird Satellite Imagery to Distinguish Two Noxious Weeds in Southern Texas** Presenter: James H. Everitt USDA-ARS, Weslaco, TX	**Mapping Fuels and Fires in Southern California Chaparral Using Hyperspectral Remote Sensing** Presenter: Philip E. Dennison University of California Santa Barbara, Santa Barbara, CA	**Forest Vigor Assessment of the Inland Northwest Using Landsat Time-Series** Presenter: Russell Beck Department of Forest Resources, Moscow, ID		
4:30 ·····5:00	**Supermaps from High Spatial Resolution Satellite Imagery for Vegetation Mapping and Monitoring** Presenter: Sam Drake Arizona Remote Sensing Center, Tucson, AZ	**Laser altimetry derived canopy fuel data products for the Black Hills Experimental Forest, South Dakota.** Presenter: Eric Rowell South Dakota School of Mines and Technology, Rapid City, SD	**Modeling investigations into mapping of forest attributes with FIA data for the state of Wyoming** Presenter: Jock A. Blackard USDA Forest Service, Rocky Mountain Research Station, FIA, Ogden, UT		

Thursday April 8, 2004
8:00—10:00 AM

Daily Agenda

Time	Salon E Resource Inventory Moderator: Joe Calderwood	Salon F Active Fire Moderator: Mike Golden	Wasatch Demo Moderator: Brad Quayle	Salon G-J Moderator: Lisa Warnecke	Park City	Salons A-D
8:00------ 8:30	**Timber Stand Delineation and Stocking Differentiation using High-Resolution Imagery** Presenter: Julie Coen Space Imaging, Salt Lake City, UT	**A Hybrid Contextual Fire Detection Algorithm Using MODIS Imagery** Presenter: Ying Li Rochester Institute of Technology, Rochester, NY	You can preview software products and applications, anytime from 8:00—11:30 and 1:00—3:00.	**State/Federal Panel** This panel provides a forum for Forest Service and state representatives to learn from each other, and identify and explore many common issues and needs.	**NASA ETheater** Fritz Hasler An hour of spectacular visualization Every hour on the hour	Poster & Vendor Session
8:30------ 9:00	**Use of Orthorectified Aerial Photography to Assess the Degree and Extent of Ice Storm Damage** Presenter: Jeffrey F. Lewis USDA Forest Service, Morehead Ranger District, Daniel Boone NF, Morehead, KY	**Integration of Surface Weather Observations with MODIS Imagery for Fire Weather Applications** Presenter: John Horel NOAA Cooperative Institute for Regional Prediction, Salt Lake City, UT	Refer to page 8 for a complete list of demos.			
9:00------ 9:30	**Detailed Imagery for Projects** Presenter: Jim Schramek USDA Forest Service, Tongass National Forest, Petersburg, AK	**National Agricultural Imagery Program Overview** Presenter: Geoff Gabbott USDA FAS Aerial Photography Field Office, Salt Lake City, UT				
9:30-----10:00	Break					

Daily Agenda

Thursday April 8, 2004
10:00 AM—1:00 PM

Time	Salon E Resource Inventory	Salon F Active Fire	Wasatch Demo	Salon G-I Tech Track Moderator: Tom Mellin	Park City	Salons A-D
10:00---10:30	**Drought Monitoring through the Use of MODIS Satellite Data** Presenter: Amy Anderson USDA Forest Service, Intermountain Region, Ogden, UT	**Remote image and field data collection for a dynamic fire modeling system** Presenter: Anthony Vodacek Rochester Institute of Technology, Rochester, NY	You can preview software products and applications, anytime from 8:00—11:30 and 1:00—3:00.	**Softcopy Photogrammetry with Leica Photogrammety Suite** Ben Dorland Leica Geosystems GIS and Mapping, Englewood, CO	**NASA ETheater** Fritz Hasler An hour of spectacular visualization	Poster & Vendor Session
10:30---11:00	**The Kentucky Landscape Snapshot Project** Presenter: Bill Luhn USDA Forest Service, R8, Daniel Boone National Forest, Winchester, KY	**Modeling Wildland Fire with DIRSIG** Presenter: Zhen Wang Imaging Science at Rochester Institute of Technology, Rochester, NY	Refer to page 8 for a complete list of demos.	**What's New in IMAGINE 8.7** Suzie Noble Leica Geosystems GIS and Mapping, Englewood, CO	Every hour on the hour	
11:00---11:30	**Assessing Forest Carbon Stock/Flux with TM Imagery and FIA Data in Coastal Virginia in Support of a Carbon Sequestration Project** Presenter: John A. Scrivani Virginia Dept of Forestry, Charlottesville, VA	**Automatic Estimation of Direction of Propagation of Fire From Aerial Imagery** Presenter: Anthony Vodack Rochester Institute of Technology, Rochester, NY		**Image Processing in ArcGIS: Imagine Analysis for ArcGIS** Ben Dorland Leica Geosystems GIS and Mapping, Englewood, CO		Poster & Vendor Session Ends
11:30---- 1:00	**LUNCH**					

Thursday April 8, 2004
1:00—3:00 PM

Daily Agenda

Time	Salon E Resource Inventory Moderator: Dave Vanderzanden	Salon F Post Fire Moderator: Mike Hoppus	Wasatch Demo	Salon G-I Tech Track Moderator: Bill Clerke	Park City
1:00------ 1:30	**Ground-based Remote Sensing with Long Lens Video Camera for Upper-stem Diameter and Other Tree Crown Measurements** Presenter: Neil Clark USDA Forest Service, Southern Research Station, Blacksburg, VA	**Advanced Airborne Fire Mapping System: a NASA Small Business Innovative Research Project** Presenter: John M. Green Sensytech Imaging Group, Ann Arbor, MI	You can preview software products and applications, anytime from 8:00—11:30 and 1:00—3:00.	**3D Feature Collection in ArcGIS: Stereo Analyst for ArcGIS** Suzie Noble Leica Geosystems GIS and Mapping, Englewood, CO	**NASA ETheater** Fritz Hasler An hour of spectacular visualization Every hour on the hour
1:30------ 2:00	**Large-Area Remote Sensing via Large Numbers of Airborne Sensors** Presenter: James Kain GeoVantage, Inc., Swampscott, MA	**Accuracy Assessment of Burned Area Reflectance Classification (BARC) and Other Mapping Methodologies for the Purpose of Rapid Response** Presenter: Andrew T. Hudak USDA Forest Service, Rocky Mountain Research Station, Moscow, ID	Refer to page 8 for a complete list of demos	**Geoprocessing in ArcGIS 9.0** Tim Clark ESRI, Broomfield, CO	
2:00------ 2:30	**Remote Sensing of Landscape-Level Foliar Moisture Using SWIR Reflectance and Principal Components** Presenter: Michael Toomey South Dakota School of Mines and Technology, Institute of Atmospheric Sciences, Rapid City, SD	**An Approach To Burn Area Mapping Utilizing MODIS Imagery** Presenter: Brad Quayle USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT		**Managing Raster data In ArcSDE 9.0** Tim Clark ESRI, Broomfield, CO	
2:30------ 3:00	**Break**				

Daily Agenda

Thursday April 8, 2004
3:00—5:00 PM

Time	Salon E Resource Inventory	Salon F Post-Fire	Salon G-I Tech Track
3:00------ 3:30	**Wildland Fire and Riparian Areas: Identifying Criteria Influencing Riparian Area Resistance to High Intensity Wildfire** Presenter: Lynn M. Decker USDA Forest Service, Watershed, Fish and Wildlife Staff, Salt Lake City, UT	**Remote Sensing Imagery Support for Burned Area Emergency Response Teams on 2003 Southern California Wildfires** Presenter: Jess Clark USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT	**Field Protocol for Map Thematic Accuracy Assessment** Presenter: Clinton K. Williams USDA Forest Service, Intermountain Region, Ogden, UT
3:30------ 4:00	**Using Remote Sensing and Geospatial Technology to Assist the Field Forester in Monitoring Forest Legacy Conservation Easements** Presenter: Steven A. Sader University of Maine, Orono, ME	**Hyperspectral Remote Sensing of Fire-Induced Water Repellent Soils, Hayman Fire, Colorado** Presenter: Sarah A. Lewis USDA Forest Service, Rocky Mountain Research Station, Moscow, ID	**Guided Super-Resolution Image Restoration** Presenter: Shawn P. Neugebauer Booz Allen Hamilton, Salt Lake City, UT
4:00------ 4:30	**Management Zones as a Geospatial Tool to Integrate Installation Activities** Presenter: Douglas C. Comer Cultural Site Research and Management, Baltimore, MD	**Mapping Burn Severity in Southern California Mediterranean Type Vegetation Using Landsat and IKONOS Data** Presenter: Anna R. Lieberman San Diego State University Geography Department, San Diego, CA	**DataDoors - A portal for field or office access to distributed imagery archives** Presenter: Paul Cunningham I-cubed: information integration & imaging LLC., Fort Collins, CO
4:30------ 5:00	**Using MODIS and ETM+ to examine the effect of spatial scale on leaf area index estimates in forest burn chronosequences** Presenter: Rachel Smith South Dakota School of Mines and Technology, Rapid City, SD	**MODIS Applications in 2003 Fire Management** Presenter: Cecily A. Ryan USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, Missoula, MT	**Surfing on Wavelets** Presenters: Jim Dielschneider, Karen Morley LizardTech , Seattle, WA

Friday April 9, 2004
8:00—10:00 AM

Daily Agenda

Time	Salon E Sensor Track	Salon F Resource Inventory	Wasatch
8:00 ·····8:30	**Quantifying SLC-Off Landsat 7 Effects for Emergency Response Burn Mapping** Presenter: Randy A. McKinley USGS EROS Data Center/SAIC, Sioux Falls, SD	**Ice Velocity Mapping of Antarctic Ice Stream and Tributaries Using Interferometric Synthetic Aperture Radar (InSAR)** Presenter: Elias Deeb University of Utah, Salt Lake City, UT	Regional Remote Sensing Specialists
8:30 ·····9:00	**The changing orbital Landscape: Platforms that support forestry applications in 2004** Presenter: Chris Hill Space Imaging, Fredrick, MD	**Resource Photography, Digital Cameras, Satellite Imagery, and Feature Analyst – A Forester's Remote Sensing Toolkit** Presenter: Karen Owens USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT	
9:00 ·····9:30	**Multi-spectral Digital Imaging system** Presenter: Jon Kish Titan Geospatial Services, Portland, OR	**Mapping and Characterizing Urban Forest with a Combination of LiDAR data and Color Digital Orthophotos** Presenter: Norm Roller Marshall and Associates, Inc., Olympia, WA	
9:30 ·····10:00	**Break**		

Daily Agenda

Friday April 9, 2004
10:00—11:30 AM

Time	Salon E Sensor Track	Salon F Resource Inventory	Wasatch
10:00 ··· 10:30	**Combining New and Old Technologies in Geologic Map Production in Utah** Presenter: Grant C. Willis Utah Geological Survey, Salt Lake City, UT	**Vegetation dynamics and erosion modeling using remotely sensed data (MODIS) and GIS** Presenter: Willem van Leeuwen University of Arizona, Tucson, AZ	Regional Remote Sensing Specialists
10:30 ··· 11:00	**Off-highway Vehicle Mapping on Bridger-Teton and Dixie National Forests: An Investigation of New Mapping Methods using Remote Sensing** Presenter: Chuck Werstak USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT	**Monitoring Rangeland Trend with Remote Sensing** Presenter: John Gillham USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT	
11:00 ··· 11:30	**Closeout**		

Salon E — Forest Health

Using Multi-frame Tools to Assess Pinyon Mortality in the Southwestern United States

Authors: Jim Ellenwood, Vern Thomas, Karen Owens
Presenter: Jim Ellenwood
USDA Forest Service, Forest Health Technology Enterprise Team, Fort Collins, CO

A multistage sampling technique for an assessment of mortality using large-extent aerial survey and imagery of different resolutions was conducted to evaluate the impacts of recent drought induced mortality caused by pinyon ips in the southwestern United States. The utility and limitations of the various resolution levels for expanding the methodology across the range of pinyon pine was assessed. This application utilized data from FIA inventory data, ground plots, aerial survey, digital photography, spot, Aviris, Quickbird, Landsat, and Modis imagery. The resultant classification covers the extent of Pinus edulis within the 4 states of Arizona, Colorado, New Mexico, and Utah with estimates of total stand density (total stems per acre, live, recent dead, and dead), percent dominance (pinyon relative proportion), and average maximum density (for P-J stand condition).

Using Remotely Sensed Data for Tamarisk Identification and Mapping

Author-Presenter: Jennifer Stefanacci
Parallel, Inc. USGS, Denver, CO

Since its introduction in the early 1800s, Tamarisk has replaced native vegetation and filled riparian areas with dense, monotypic stands. Ongoing drought conditions increase concerns about the presence of this aggressive, invasive plant. The BLM Monticello Field Office has a long-term, integrated weed control program along rivers and riparian areas in San Juan County, Utah. Key to a successful program is the identification of tamarisk populations. As an alternative to traditional ground surveys, classification of remotely sensed data may provide a cost effective, expeditious mapping solution. A combination of techniques was used to identify tamarisk populations including data compression, identification of at-risk areas, and supervised and unsupervised classification. Ultimately, the results were mapped so that land managers could determine priority areas for the weed control program and field crews could efficiently locate treatment areas.

Salon F — LANDFIRE

Current Findings of the Interagency LANDFIRE Landscape Modeling and Mapping Prototype Project

Authors: Tracey S. Frescino, M.G. Rollins, R.E. Keane, Z. Zhu, W. Hann, A. Shlisky
Presenter: Tracey S. Frescino
USDA Forest Service, RMRS, FIA, Missoula, MT

LANDFIRE is an interagency effort to develop a comprehensive suite of standardized, multi-scale spatial data layers and software to support implementation of the National Fire Plan and Cohesive Strategy across the United States. LANDFIRE integrates several methodologies for predictive landscape modeling including biophysical gradient modeling, remote sensing, vegetation and fuels modeling, and ecophysiological simulation into a process for mapping vegetation, fire, and fuel characteristics. LANDFIRE will create maps that characterize vegetation condition, fire behavior and effects, and departures from historical fire regimes, known as fire regime condition classes. These maps may be used for prioritizing areas for hazard reduction, landscape rehabilitation, and ecological restoration projects. LANDFIRE models and methods are currently being developed and tested in two large prototype areas in the western United States at 30-meter pixel resolution. Here we discuss the current status and findings of the models and methods used for these two prototype areas.

Fires 2003 – Mapping Vegetation and Fuel Characteristics in Support of the Northern Rockies Multiple Agency Coordination Group

Authors: Donald Long, Matthew Rollins, Tracey Frescino
Presenter: Donald Long
USDA Forest Service, RMRS, Fire Sciences Lab, Missoula, MT

On August 12th, 2003, scientists at the Missoula Fire Sciences Laboratory were asked to support the Northern Rockies Multiple Agency Coordination Group (MAC) in their efforts to evaluate potential fire activity for 33 large fires, managed by 4 Area Command Teams, in Western Montana. Overlap between the Northern Rockies LANDFIRE prototype area and MAC area of operations created a unique opportunity to use the LANDFIRE field reference database and LANDFIRE fuel mapping protocols to create maps of vegetation and fuel characteristics. In a three week period, we created 30 m resolution FARSITE fuel maps for the 2003 firefighting efforts by incorporating biophysical settings data using a regional scale terrain and climate model, potential vegetation type data created by merging the biophysical settings map with a national landuse/land cover map (NLCD), and vegetation classes created by classifying LANDSAT 5 and LANDSAT 7 satellite imagery from the summer of 2002 and 2003.

Wasatch — New Technology

LiDAR - The Future of Remote Forest Assessments?

Authors: David L. Evans, William H. Cooke III
Presenter: David L. Evans
Department of Forestry, Mississippi State, MS

LiDAR (Light Detection and Ranging) is a remote sensing technology that has great potential in forest resource management. It provides high measurement precision that can be used for terrain mapping and tree/stand measurements. This presentation will introduce LiDAR as a new measurement tool for forestry. Projects that have been completed or are still underway at Mississippi State University will be summarized and include: 1) a forest inventory protocol that is being operationally tested, 2) forest structure analysis, 3) forest typing, 4) LiDAR and satellite data for regional forest assessment, and 5) stand visualization based on LiDAR measurement data.

Extracting Natural Geospatial Features from LiDAR

Authors: David Opitz, Stuart Blundell, Chris Finlayson
Presenter: Matt Morris
Visual Learning Systems, Inc., Missoula, MT

There is a significant need for feature extraction tools that exploit high resolution terrain data, such as can be derived from LIDAR, to compliment natural resource GIS applications. High resolution 3D information for natural features, such as trees, is critical for analyzing canopy structure to support geospatial applications related to Forest Monitoring, Forest Health, Wildland Fires, etc. This paper presents results from extensive testing of the newly developed Feature Analyst LIDAR toolkit. This toolkit uses 3D information to extract detailed natural resource information, such as canopy cover and fuel loads. The test results presented in this paper on multiple data sets demonstrate that the Feature Analyst LIDAR toolkit can extract terrain and species information at an accuracy rate heretofore unachievable with multispectral imagery. The paper ends with a discussion of how natural resource personnel can fully utilize the Toolkit in their everyday environment.

Salon E — Forest Health

Multi-scale Analysis of Aerial Photography to Detect Sulfur Cinquefoil in Interior Pacific Northwest Rangelands

Authors: Bridgett J. Read, Bryan A. Endress, Catherine G. Parks
Presenter: Bridgett J. Read
USDA Forest Service, Pacific Northwest Research Station, La Grande, OR

We evaluated the effectiveness of natural color aerial photography to detect sulfur cinquefoil (Potentilla recta L.), an invasive plant. Photography was collected at three scales (1:3,000, 1:6,000, 1:12,000) in early July when sulfur cinquefoil was at peak bloom. A 250-m grid was superimposed over photographs and at each grid point (n=80) we visually estimated sulfur cinquefoil presence and cover. In the field, we located grid points using a GPS and recorded sulfur cinquefoil cover and vegetation composition. Results indicate the accuracy of detecting sulfur cinquefoil increased from small to large scale, 59% to 77% respectively. Tree cover hindered photo-interpretation estimates. Detection of low density infestations was possible at all scales. Accuracy of percent cover estimates ranged from 30-37.5%. Our results indicate aerial photography can be used to detect sulfur cinquefoil infestations in open forests and rangelands in the intermountain West.

Salon F — LANDFIRE

LANDFIRE Project: Vegetation Mapping for Natural Resources Applications

Authors: Zhiliang Zhu, James Vogelmann, Donald Ohlen
Presenter: Jeff Eidenshink
USGS, Sioux Falls, SD

The LANDFIRE project is funded jointly by the USDA Forest Service and the Interior Department to inventory fire fuels and assess fire danger at the national scale. The foundation of the project is a comprehensive vegetation database developed by mapping and characterizing vegetation types and structure attributes using advanced remote sensing and ecological modeling techniques. In addition to the primary uses to characterize fire fuels and monitor fire danger, the vegetation database is also useful to a broad range of resource applications. In this paper, we will discuss areas of applications using LANDFIRE deliverables, focusing particularly on invasive species mapping, insect and disease modeling, and biomass/carbon research.

Wasatch — New Technology

The Use of Airborne LiDAR and Aerial Photography in the Estimation of Individual Tree Heights in British Forestry

Authors: Juan C. Suárez, Carlos Ontiveros, Steve Smith, Stewart Snape
Presenter: Juan C. Suarez
Forest Research, Roslin, United Kingdom

This document describes the use of high resolution Aerial Photography (23x23 cm in RGB) and airborne LIDAR with a high density of returns (4 per sq. m), for the estimation of individual tree heights in forest stands. The advantages and disadvantages in the use of LIDAR are revised in a forested area in Scotland. An algorithm was devised to extract a high resolution digital terrain model of the bare ground. This information was used to obtain a tree canopy model as a difference between the laser first pulse and the model of the underlying terrain. The information at a tree level was obtained by image segmentation and classification using eCognition and data fusion analysis. The individual tree height recovery model was able to predict 73% of all the tree heights within 1 m, 91% within 1.5 m and 96% within 2 m. These results where consistent in all diameter classes.

Salon E — Forest Health

Digital Aerial SketchMapping: A Method for Mobile GIS Data Collection.

Author-Presenter: Mike McWilliams
Oregon Dept of Forestry, Insect and Disease Lab

Aerial sketchmapping is the geo-locating of features that are seen on the ground below the aircraft, and the subsequent recording of these features on maps or photographs. RSAC, FHTET, and state cooperators have developed a digital aerial sketchmapping (D-ASM) system to directly record these features as a digital file. The surveyor sketches features on a touchscreen connected to a Laptop PC running GPS data collection software developed by Michael Baker, Jr., Inc. (GeoLink). The software features automatic tracking of the aircraft's position on the map base and shapefile output. Standard raster file formats (.tiff, MrSid) can be used for background maps. Use of this system has greatly decreased delivery time of survey data to forest health customers, and has increased the quality of that data. This system was developed for forest health surveyors, but it can be an efficient data collection tool for other field geospatial projects.

Communities at Risk of Wildfire on Alaska's Kenai Peninsula Use Remote Sensing and Mobile GIS Tools on the Ground

Author-Presenter: Marvin Rude
Kenai Peninsula Borough Spruce Bark Beetle Mitigation Program, Soldotna, AK,

In the recent past the spruce bark beetle of South Central Alaska has experienced a population explosion, resulting in the sudden mortality of tens of millions of spruce trees. Entomologists say the outbreak is the largest of it's kind in North America. Mitigating the wildfire risk to communities and hazardous evacuation routes left in the wake of the infestation is the primary concern of the Spruce Bark Beetle Mitigation Program of the Kenai Peninsula Borough.
The Spruce Bark Beetle Mapping Program uses a variety of remote sensing and GIS tools to map forest health, vegetation, fuels and community wildfire risk.
In the air we use high resolution satellite imagery, 1:30,000 Color Infrared (CIR) aerial photography, Digital Ortho Quads, Kodak Digital Field Imaging System and aerial insect surveys.
On the ground we use Garmin GPS hardware with ESRI's ArcPad mobile geographic technologies and high resolution satellite imagery to do field work. All these tools make it possible to assess current wildfire risk to communities and set priority projects for treatment.

Salon F — NASA Track

Collaborative Efforts in R&D and Applications of Imaging Wildfires

Authors: James A. Brass, Paul Greenfield, Steve Wegener
Presenter: Vincent G. Ambrosia
California State University - Monterey Bay / NASA-Ames, Moffett Field, CA

NASA-Ames and the US Forest Service were recently funded to explore cutting edge technologies in fire imaging, telemetry, data / information integration, and UAV platform demonstrations to facilitate a "technology adaptation" and integration mechanism into the fire management community. The collaborative effort will involve participation from organizations such as RSAC, NIFC, NASA and affiliated universities. The collaborative effort will focus on R&D, test and evaluations, and integration of new technologies into the remote sensing fire imaging community. The over-arching goal of the effort is to allow fire mitigation agencies to be on the forefront of developing technologies, to share expertise and knowledge, and to come to an improved understanding of fire imaging and data / information integration to allow a more rapid decision-making mechanism for the fire mitigation community. This paper will address the collaborative efforts, technology-focus areas and demonstration concept plan for the program effort.

Bi-spectral Infrared Detection Mission for Innovative Fire Observation

Author-Presenter: Dr. Dieter Oertel
German Aerospace Center (DLR) Optical Information Systems, Berlin, Germany

The DLR satellite on Bi-spectral InfraRed Detection (BIRD) was piggy back launched with the Indian Polar Satellite Launch Vehicle on 22 October 2001. One main objective of the BIRD mission was to test a bi-spectral push broom IR sensor: the Hot Spot Recognition System (HSRS). It provides data allowing quantitative analysis of very large high temperature events (HTE) as well the analysis of small sub-pixel HTE. This BIRD hot spot recognition algorithm includes adaptive thresholding in the mid infrared channel to detect potential hot pixels and additional adaptive ratio tests of the mid-infrared signal to the signals in the near and thermal infrared to reject false alarms. The paper presents results on active fire recognition in Australia, Siberia, Europe, Canada, and USA. Temperature, area and radiative energy release of the fires are estimated. A comparison with fire data obtained from the Moderate Resolution Imaging Spectro-radiometer on EOS Terra is given.

Wasatch — New Technology

Accessible Technology to Effectively Orthorectify Digital Aerial Photos and Applying Value Addition Tools

Authors: Kevin Megown, Mike Morrison
Presenter: Kevin Megown
USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT

Current technologies available to Forest employees, offer a quick and easy to learn method for creating orthorectified digital aerial photo products. The process is robust enough to utilize either scanned historical hardcopies or newfangled digital photo technologies. The program is part of the Leica Geosystems suite available to the FS, originally called ERDAS Orthobase, now called Leica-Photogrammetry-Suite (LPS). The basic product of the LPS is a series of individual orthorectified images, but these images can easily be stitched together to create a seamless and color balanced image using the mosaic process. Post-LPS production, allowing for data interpretation and data extraction, include other ERDAS modules, StereoAnalyst, ImageAnalysis and StereoAnalyst for ArcGIS, and other geospatial programs, ESRI ArcView and ArcGIS, Visual Learning Systems FeatureAnalyst and PCIGeomatics eCognition. The digital product allows for post-processed products to be utilized by many users in both hard and soft copy.

Application of Orthorectified Aerial Photos in Feature Analyst to Understand Burn Intensity.

Author-Presenter: Geno Bassette
USDA Forest Service, Northern Region, Missoula, MT

Create Digital Ortho Quads using up to date scanned resource photography or digital photos in ERDAS OrthoBASE. After the fires of 2003 in Region One, several fires were flown with resource photography and we needed a way to accurately and in a timely manner, Orthorectify and mosaic these images using local talent with already available software. This procedure was demonstrated on the 30,000-acre Snow-Talon fire and 53,000-acre Wedge fire using Ranger District and Supervisor personnel to create a continuous mosaic. Post burn mapping was then classified into three groups: high, medium and low intensity using another available software, Feature Analyst. OrthoBASE was so successful with resource photography, we then applied the same orthorectified application to digital photos taken with the Color Infrared (CIR) Digital Camera and came up with the same positive results.

Salon E — Forest Health

Using the Tasseled Cap Transformation to Identify Change in the Missouri Ozark Forests

Authors: Ronnie Lea, Clayton Blodgett, Mike Schanta, David Diamond
Presenter: Ronnie Lea
Missouri Resource Assessment Partnership, Columbia, MO

The forest change methodology implemented here is in response to United States Forest Service and Missouri Department of Conservation desires to have a technique that is capable of detecting subtle changes in forest health, so remediation measures can be applied before the stand is totally lost. In this research the "wetness" component from the tasseled cap transformation was investigated as a means of determining change from multitemporal satellite scenes. The tasseled cap transformation was applied to each scene and the wetness components were composited into a single scene. Unsupervised classification was then applied to the scene. Each cluster was assigned to one of three change classes. The resultant classification was compared to a Forest Service polygon shapefile of areas that had experienced some management activity during the last 8 to 12 years. The classification detected over 80% of all management activities forest-wide evidenced in the Forest Service shapefile.

Salon F — NASA Track

Use of MODIS for Active Fire Detection and with EO-1 for SensorWeb Applications

Authors: Robert Sohlberg, Jacques Descloitres, Stuart Frye, Louis Giglio, Jeremy Jones, Chris Justice, Dan Mandl, Jessica McCarty
Presenter: Robert Sohlberg
University of Maryland, College Park, MD

Thermal data from the MODIS instruments onboard NASA's Terra and Aqua satellites are processed to map active fires at a 1km spatial resolution. Four observations per day are used for strategic mapping of active wildfires in the United States. A software system called Rapid Response allows users with direct broadcast receiving stations to create fire detection products in real-time. Implementation is planned for the VIIRS instrument to be launched onboard the NPP and NPOESS satellites in 2006 and 2009, respectively. We discuss the technical aspects of the fire algorithm, the Rapid Response system, and planned VIIRS products. A multi-instrument SensorWeb uses the fire detection data from MODIS to task the ALI high resolution instrument onboard EO-1 for post-fire rehabilitation applications. Experiments are currently being conducted to use cloud data from GOES to optimize for cloud free acquisition. Additional satellite and airborne instruments are being added.

Wasatch — New Technology

Objective Landslide Detection and Surface Morphology Mapping Using High-Resolution LiDAR

Authors: Jim McKean, Josh Roering
Presenter: Jim McKean
USDA Forest Service, Rocky Mountain Research Station, Boise, ID

A map of extant slope failures is the most basic element of any landslide risk assessment. Conventional landslide inventory maps are subjective, tedious to compile, and difficult to make in vegetated terrain. Alternatively, we analyzed high-resolution DEMs made from LIDAR data to map a large landslide complex. Landslides are rougher than adjacent unfailed terrain and planar, circular and spherical statistics were used to evaluate this roughness and automatically detect and map the overall slide complex. Circular and spherical statistics and the Laplacian operator also defined four kinematic units within the slide complex. Power spectra analyses quantified how roughness varies with length scale. Different styles of landslide deformation produce distinctive spectral peaks that correspond to the scale of deformation features. These topographic-based analyses may be used to objectively map landslide features, generate mechanical inferences about landslide behavior, and evaluate relatively the recent activity of slides.

Salon E — Utah Track

Land Cover Mapping for the Southwest Regional Gap Analysis Project

Authors: John Lowry, Douglas Ramsey
Presenter: John Lowry
RSGIS Laboratory, College of Natural Resources, Logan, UT

The Southwest Regional Gap Analysis Project is a collaborative effort of five southwestern states (Arizona, Colorado, Nevada, New Mexico, and Utah) to develop a region-wide gap analysis independent of state boundaries. The presentation focuses on the land cover mapping portion of the project. Approximately 85 Landsat ETM+ scenes are needed to cover the five-state region. Our methodology involves segmenting the region into 40 "spectro-physiographic" mapping zones. Using multi-date imagery and ancillary DEM derived data, we are using a Classification Tree algorithm to model natural and semi-natural vegetative cover. Completion of the southwest regional land cover map is anticipated for June 2004. This regionally consistent product will provide land managers and planners with a GIS land cover dataset suitable for large landscape regional planning and management.

Comparing ASTER DEMs with GPS Elevations

Author-Presenter: Andrew Ford
University of Utah, Salt Lake City, UT

The ASTER instrument aboard the TERRA platform provides a significant new source of digital elevation models (DEMs). Bands 3N and 3B operate in stereo, which allows surface elevations to be calculated from parallax and orbital data. An ASTER image acquired over the Bering Glacier (south east Alaska) during August 2003 has been compared with surface elevations measured during a simultaneous field campaign using both hand held and differential GPS. These results represent an important test of the technique over relatively flat and low contrast surfaces.

Salon F — NASA Track

Wildfire Airborne Sensor Program (WASP): A New Wildland Fire Detection and Mapping System

Authors: Donald McKeown, Juan Cockburn, Jason Faulring, Robert Kremens, David Morse, Harvey Rhody, Michael Richardson
Presenter: Donald McKeown
Rochester Institute of Technology, Rochester, NY

The Wildfire Airborne Sensor Program (WASP) is a high performance multi-spectral (LWIR, MWIR, SWIR, Vis) wildfire detection and mapping sensor system developed by RIT. WASP is currently undergoing flight testing and calibration. In addition to the sensor, RIT is developing an Airborne Data Processor (ADP) that will process the WASP sensor data and render a geo-referenced information product on the aircraft in near real-time. This presentation will describe the WASP sensor and the concept for the ADP as well as provide a snapshot of our progress to date. This work was supported by the National Aeronautics and Space Administration under Grant NAG13-02051. This financial support has been greatly appreciated.

Geostationary Satellite Fire Monitoring Using the Wildfire ABBA

Authors: Elaine Prins, Chris Schmidt and Joleen Feltz
Presenter: Elaine Prins
NOAA/NESDIS Advanced Satellite Products Team, Grass Valley, CA

Although primarily designed for meteorological applications, the NOAA series of Geostationary Operational Environmental Satellites (GOES) offers the unique opportunity to detect fires as they occur with the capability for routine high-temporal monitoring. This paper presents an overview of recent advances in real-time geostationary fire detection with examples in a variety of biomes in North, Central, and South America. The focus of this paper is fire monitoring using the Wildfire Automated Biomass Burning Algorithm (WF_ABBA). Throughout the Western Hemisphere the GOES WF_ABBA is being used to detect and monitor both anthropogenic and wild fires in real-time for hazard support activities and for documenting and evaluating the impact of biomass burning on the environment. The user community includes global change research scientists, the aerosol transport modeling community, the land-use/land-cover change research community, government agencies, resource managers, international policy and decision makers, educational institutions and the general public.

Wasatch — GPS Applications

Utilization of Personal Data Assistants Linked to GPS Receivers to Resurvey Red-Cockaded Woodpeckers on the Osceola National Forest

Authors: Carl J. Petrick, David C. Rubino
Presenter: Carl J. Petrick
USDA Forest Service, National Forests in Florida, Tallahassee, FL

The Osceola National Forest in north central Florida supports a significant population of the federally endangered Red-cockaded woodpecker (RCW). Due to staffing limitations, the population had not been resurveyed since the last contract survey in 1999. In 2003, a regional team of biologists was formed to resurvey the population. To obtain optimum efficiency, the contractor's 1999 legacy data (GPS locational data and cavity tree attribute data) was restructured to support a graphic environment accommodating reattribution by persons unfamiliar with the forest and/or RCW biology. A cost-effective hardware and software plan compatible with the Forest Service's Natural Resources Information System was essential. Compaq IPAQ 2210 personal data assistant units with ArcPad software were linked to both Garmin 17N and Holux GM-270 GPS receiver units. Both systems were very portable, demonstrated 2 to 3 meter accuracy and performed well at a cost less than $1,000.00 each.

GPS Mapping Using WindowsCE·Data Collector with Background Maps

Author-Presenter: Carma Ingram
Monsen Engineering, Salt Lake City, UT

This presentation will include GPS and how it works, as well as, what's new with the GPS technology. This will include real-time accuracies and new technology now available in GPS equipment for GIS applications. GPS can be used as a valuable tool in field collection of inventories of any type of property where geographic location and database information for GIS is important. GPS is a fast field data capture tool, providing a reliable and accurate location along with detailed attributes of the feature. Field collection can now be done with a handheld GPS receiver or GPS receiver connected to a dedicated datalogger, pen based computer or Windows CE device giving the user the option of the tool that best works for their application. Field collection options with Trimble GPS systems will be discussed in detail including the "NEW" Trimble Handheld GeoExplorer CE Series.

Salon E — Utah Track

Snowmelt Runoff Modeling Using Active Microwave Remote Sensing in the Arctic

Authors: Angira Baruah, Richard R. Forster, Randall P. Julander
Presenter: Angira Baruah
Dept. of Geography, University of Utah/ USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT

Mapping the extent, water content, and state of snow cover is most important in determining future runoff, whether to forecast floods or to forecast the amount of water that will be available for irrigation or hydroelectric power generation (Ulaby et al., 1981). Because of their sensitivity to very small amounts of moisture in the snow along with the ability to penetrate cloud cover, Active Microwave Sensors are ideal for detailed monitoring of snow cover in areas where manual survey becomes difficult. This paper analyzes a SeaWinds image dataset coupled with a Snowmelt Runoff Model to study the onset of snowmelt and forecast stream flow for the Kuparuk Watershed on the North Slope of Alaska. The simulation resulted in good agreement between the simulated and measured runoff for the snowmelt period during the month of June 2000 which indicates the usefulness of SeaWinds data for snow hydrology applications.

Analyzing the Effect of Increased Impervious Surfaces on Water Quality in Utah Lake

Authors: Renee Gluch, Shawn Callihan, Tiana Davis, Mark Jackson
Presenter: Tiana Davis
BYU Geography Department, Provo, UT

Human impacts on the natural environment are profound. Utah Lake, located approximately 35 miles south of Salt Lake City, is adjacent to several growing municipalities in Utah County. Rapid urban growth has caused a land cover conversion from natural landscapes to urban impervious surfaces, causing increased surface water run-off. The purpose of this paper is to examine the potential links between urbanization and decline in water quality of Utah Lake. For this study, an urban land cover change detection is performed using a series of Landsat 5 and Landsat 7 images of the Utah County area over the last ten years. The remotely sensed data will be analyzed in conjunction with in-situ field and water quality data to assess both direct and indirect impacts of urbanization on water quality within the lake. Preliminary results suggest that there is a correlation between the growing urban population and decline in water quality.

Salon F — NASA Track

Continuing a Tradition of Excellence - Thermal Infrared Wildfire Detection and Mapping by the National Infrared Operations (NIROPS) Group

Author-Presenter: Steve Trulove
USDA Forest Service, Region 4, Boise National Forest, Boise, ID

Forty years after initial trials, airborne thermal infrared line scanning continues to be the primary method of remote intelligence gathering for large wildfire mapping in the U.S. The evolution of detection hardware and software has been and is dynamic. Remarkably, functional productivity of the NIROPS systems has never been sacrificed during a wildfire season for additional R&D since their initial production deployment in 1967. Why is this program so successful? A review of technology dynamics from 1962 during PROJECT FIRESCAN until today's PHOENIX fire detection system explains the increasing system capabilities and broadening data utility, but yields an incomplete picture of program successes. Cutting-edge technology and software development will continue to enhance system potential, but the static elements of time tested procedures and individual commitment will assure the timely delivery of accurate thermal infrared intelligence, and ensure continuation of the NIROPS tradition of excellence.

Airborne Data Systems' Support During the 2003 Montana Wildfire Season

Author-Presenter: Jay Fuhr
Airborne Data Systems, Wabasso, MN

During the 2003 Montana wildfire season Airborne Data Systems Inc. was called out to use our five band (blue, green, red, NIR, TIR 3-5micron) Spectra-View system to locate and map fire progression for several different fire camps. During this time the University of Montana Fire Research Lab and Airborne Data Systems Inc. worked closely together, with the people from the University coordinating the flight efforts and interpreting the fire information and Airborne Data Systems collecting the data, processing, and disseminating the data. The major advancement to the field user made during this time was that for the first time a field team without an IR interpreter was able to receive airborne imagery for their fire. This advancement was made because of the uniqueness of the digital data being interpreted prior to distribution, and then being posted to a common server, allowed everyone access to the data.

Wasatch — GPS Applications

Global Positioning System Accuracy Under Varying Forest Canopy Conditions

Authors: Jason A. Cole, William Stiteler IV
Presenter: Jason A. Cole
State University of New York College of Environmental Science and Forestry, Syracuse, NY

The positional accuracy of ground reference data used for remote sensing image analysis is important. Accuracy is particularly important if the reference is used with imagery of high spatial resolution, where an error of a few meters in reference location can render the reference useless for some applications. GPS coordinate quality is usually defined in terms of precision because absolute accuracy is difficult to assess when a measurement is not part of a network. Conditions under which a GPS receiver is used can significantly alter absolute accuracy, as the satellites signals are blocked or reflected. This presentation describes a method of assessing the absolute accuracy of survey grade Leica GPS receivers under varying forest canopy conditions. Point locations used to compare with GPS acquired positions were established using conventional surveying techniques. The absolute accuracy ranged from 0.014 meters to 10.509 meters.

Accurate Velocity Estimates from Inaccurate GPS Data

Authors: Norm Cimon, Mike Wisdom
Presenter: Norm Cimon
USDA Forest Service, PNW Experiment Station, La Grande, OR

It's possible to obtain an accurate velocity estimate from GPS data that is independent of any assumed error distribution associated with the GPS readings. The technique progressively swamps the GPS error and derives an asymptotic velocity estimate in the process. The technique was used to derive the average velocity for four sets of recreation visitor trials on a rural forest road system: for hikers, bikers, horseback riders, and all terrain vehicle users.

Salon E — Resource Inventory

The Southwestern Region Mid-Scale Existing Vegetation Mapping Project

Authors: Thomas Mellin, William Krausmann, Wayne Robbie
Presenter: Thomas Mellin
USDA Forest Service, Southwestern Region, Albuquerque, NM

The Region 3 Geospatial and EAP/WSA staffs have begun a Southwestern Region Mid-Scale Existing Vegetation Mapping Project. It is a 5 year project, beginning in FY04, to map approximately 3 National Forests per year. The project timeline and schedule is tied to the Forest Plan Revision schedule and will be collaboratively accomplished by Forest and Regional Office staffs. The products generated will include GIS layers/tabular data for vegetation cover type, canopy cover, and vegetation structure (size class) at the mid-scale (1:100,000) level. Landsat imagery will be used as a base for image segmentation and initial physiognomic classification. Aerial photography interpretation and plot data will be used as training sites to assign cover type, canopy closure, and size class and for accuracy assessment.

A Change Detection System for Natural Resource Applications

Authors: Matt Morris, David Opitz, Stuart Blundell
Presenter: Matt Morris
Visual Learning Systems, Inc., Missoula, MT

Monitoring change through remote sensing has numerous natural resource applications, such as monitoring agricultural lands, mapping noxious weeds, disaster monitoring, ecosystem monitoring, fire detection, and countless other applications. Detecting changes of specific features between imagery over time is currently a slow, labor-intensive, painful, and costly process. Previous attempts to automate the change detection process have not been able to provide accurate enough information. These attempts detect all changes in the image, including image misregistration, changes in season, moving of shadows, etc. This paper presents the first viable system for automating target-specific change-detection. Results on several datasets show our technique is accurate at extracting only changes of interest, saves a considerable amount of labor, has a simple user interface, and works directly within ArcGIS and/or ERDAS IMAGINE.

Salon F — Active Fire

Ground-based Thermal Observations of the Black Mountain 2 Fire in Montana, 2003

Authors: Patrick H. Freeborn, B. L. Nordgren, W. M. Hao
Presenter: Patrick H. Freeborn
USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, Missoula, MT

Since thermal imaging systems are traditionally flown aboard airborne platforms during wildland fires, a ground-based deployment of a mid-wave IR sensor has largely been overlooked. By strategically selecting a vantage point, and by considering the spatial and temporal resolution of the observation, several properties of a landscape fire can be monitored based solely upon visual interpretation. These properties include fire perimeter, area, spread rate, and radiometric temperature. If thermal images are recorded, and a spatial analysis performed, the radiative energy release rate can be calculated. Furthermore, if sequences of thermal images are georeferenced, then these properties can be mapped as a function of time. Advantages and disadvantages of this approach will be presented in a case study of the Black Mountain 2 Fire in Montana, August 2003. Although this case was a wildland fire, this approach will offer an opportunity to document fire properties of prescribed fires.

Improved Fire Temperature Estimation Using Constrained Spectral Unmixing

Authors: Ambrose Ononye, A. Vodacek, R. Kremens
Presenter: Ambrose Ononye
Rochester Institute of Technology, Rochester, NY

Accurate estimation of wildland fire temperature from remote imagery would be useful in improving prediction of fire propagations and estimates of fire effects such as burn severity and greenhouse gas production. Previous work with AVIRIS has established the feasibility of estimating temperatures for subpixel fires by spectral unmixing. However, this unmixing approach can produce optimizations for fractions temperatures that are not physically related to the fraction of flaming combustion in a pixel. We describe a technique for improving this approach by using the potassium emission to determine which pixels actually contain signal from flaming combustion. A non-linear, constrained multi-dimensional optimization procedure was applied to the model to estimate fire temperature and its areal extent as well as the corresponding background temperature. Results for this approach using AVIRIS data sets acquired over Cuiaba, Brazil (1995) and the San Bernardino Mountains (1999) are presented.

Salon G-I — Data Warehousing

An Online System for the Retrieval of Digital Imagery

Authors: Greg C. Liknes, B. Tyler Wilson, Dale D. Gormanson
Presenter: Greg C. Liknes
USDA Forest Service, North Central Experiment Station, St. Paul, MN

The North Central Research Station, Forest Inventory and Analysis program (NCFIA) conducts research to improve the understanding of forest ecosystems in the north central United States through annual inventories and analyses. Preparation for field data collection involves the interpretation of imagery at NCFIA plot locations. In order to improve access to imagery, such as digital orthophoto quads and digital raster graphics, NCFIA has developed an image server, operating on a Snap Server running Windows 2000. The image server has been integrated with a set of custom ArcMap tools that allows the automated retrieval of an image for each plot. Prior to the development of this system, technicians queried an index to identify the appropriate image and retrieved it from a collection of more than 4,000 CD-ROMs. By improving access to imagery, this system has resulted in greater efficiency in the field data collection effort.

FSGeodata - The Forest Service Geospatial Data Clearinghouse

Authors: Matt Sheehan, Jacek Gonciarz, David George, Keith Lannom
Presenter: Matt Sheehan
USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT

The FSGeodata Geospatial Data Clearinghouse is an online application for querying, researching, assessing, and obtaining Forest Service geospatial data holdings. The Clearinghouse is a joint effort of the Remote Sensing Applications Center and the Geospatial Service and Technology Center under the sponsorship of the Forest Service Geospatial Executive Board and the Geospatial Advisory Committee. The Clearinghouse provides public and agency access to geospatial data and associated metadata using ArcIMS and Oracle SDE. This presentation describes the components of the Clearinghouse, its organization, available data sets, usage, and future planned enhancements.

Salon E — Resource Inventory

USDA Forest Service Mapping Standards for Existing Vegetation - A Test of the Base Level Standards

Authors: Brian Schwind, Ralph J. Warbington, Hazel Gordon, Ron Brohman
Presenter: Brian Schwind
USDA Forest Service, Pacific Southwest Region USFS, Sacramento, CA

Early in 2003, draft vegetation classification and mapping agency wide standards were released by the USDA Forest Service. The standards were designed to ensure consistency with Federal Geographic Data Committee (FGDC) standards, address the ongoing information needs of the Forest Service, and provide a consistent but flexible basis for classifying and mapping existing vegetation. As the final phase of a draft review process, the mapping standards were applied through a pilot project. The base (i.e., most detailed) level mapping standards were tested on a watershed in the Stanislaus National Forest of California using a combination of remote sensing technologies and direct field observations. The reported results are intended to give insight into the feasibility, cost effectiveness, and accuracy of mapping the standard vegetation attributes, including National Vegetation Classification System (NVCS) equivalent alliances and associations.

Salon F — Active Fire

Innovative Tactical Wildfire Assessment Using High Resolution Satellite Imagery

Authors: William Whatley, Jason San Souci, George Greenwood, Kevin Opitz
Presenter: William Whatley
NCDC, Colorado Springs, CO

There is a continuing catastrophic wildfire threat to more than 190 million acres of forested land in the western United States resulting in a critical need to protect communities in the Wildland Urban Interface. This presentation examines a real-world application involving the use of high resolution satellite imagery and advanced Remote Sensing and GIS analytical techniques for the detailed mapping and assessment of forest resources and the identification of wildfire risks to enable Federal, State, and municipal agencies and communities to develop prioritized plans and to implement timely, effective mitigation programs. Emphasis is placed on the use of DigitalGlobe's QuickBird high resolution satellite imagery and automated feature extraction and classification using VLS's Feature Analyst Extension for ERDAS Imagine.

Salon G-I — Data Warehousing

Web-Based Geospatial Data Ordering for Wildland Fire Support

Author-Presenter: Jeff L. Sloan
USGS - Rocky Mountain Mapping Center, Denver, CO

Geospatial data has been increasingly utilized to support wildland fire planning, suppression and mitigation efforts. The USGS Rocky Mountain Mapping Center in conjunction with the U.S. Forest Service, BLM,and local governments has supported these efforts during the past three fire seasons. Base data requests have included the 1:24,000-scale Digital Raster Graphic (DRG), Digital Orthophoto Quadrangles (DOQ), Digital Elevation Models (DEM) raster datasets and transportation, hydrology, and boundary vector information. The USGS has implemented an internet-based data ordering service for use in wildfire applications for Geographical Information System technical specialists and fire managers. The application allows for interactive display of maps integrated with current wildfire information and is enhanced with the capability to process, reproject, mosaic and tone balance DRGs, DOQs, and DEMs and automatically disseminate the data for users to download or to initiate delivery of data on CD-ROM using various mail delivery methods.

Salon E — Resource Inventory

Digital Mylar: A Tool to Attribute Vegetation Polygon Features Over High Resolution Imagery

Authors: Ralph Warbington, Jess Clark, Brian Schwind, Mark Finco
Presenter: Jess Clark
USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT

The Digital Mylar was developed as a joint software development project between the US Forest Service Remote Sensing Applications Center (RSAC) and the Pacific Southwest Region (Region 5) Remote Sensing Lab. Digital Mylar provides templates for tree size and cover and other tools to help users objectively attribute vegetation polygon features digitized or derived from high-resolution imagery. High-resolution imagery is an important source of information for forest and range manager. There is a need to conduct consistent mapping to national standards among forests to produce existing vegetation GIS layers depicting floristic levels and attributes. The Digital Mylar templates aid in accomplishing consistency as these GIS data layers are captured and recorded. This tool exists for the ArcGIS 8 platform, and continues to be developed to help users make objective observations and records from the high-resolution imagery.

Updating Landtype Association Mapping Techniques in Region 6 Using the Terrestrial Ecological Unit Inventory (TEUI)-Geospatial Toolkit

Authors: D.R. Ufnar, B.E. Frazier, A.J. Busacca, Duane Lammers
Presenter: D.R. Uflar
Dept. of Crop and Soil Sciences, Washington State University, Pullman, WA, Pullman, WA

Region 6 has been examining new strategies for Terrestrial Ecological Unit Inventory (TEUI) mapping as part of forest plan revision, and for forest and watershed analysis. The goal is a protocol for an efficient and repeatable way of completing TEUI projects at the landscape scale. The TEUI-Geospatial Toolkit combines enhanced visualization tools, on-screen digitization, analysis, and final map production, in a user-friendly format. A 33,000 acre watershed within the Mount Baker Snoqualmie National Forest of Central Washington was chosen as the study site. Utilizing existing digital information (geology and potential natural vegetation maps, digital elevation model, and Landsat imagery) and the visualization and digitization tools provided in the Geospatial Toolkit a Landtype Association (LTA) map was generated. The map was then field verified and used in a parallel study as a soil survey premap to show the linkages between scales within the National Hierarchical Framework.

Salon F — Active Fire

Phoenix - The New Digital Fire Detection/Mapping Platform

Authors: Woody Smith, Tom Gough, David Chamberlain
Presenter: Woody Smith
USDA Forest Service, NIFC, Boise, ID

The paper will present the process of development, the operation, and the potential uses of the new USDA Forest Service's Infrared Fire Detection and Mapping system known as Phoenix. The design and operational interface will be discussed as well.

Infrared Field User's Guide and Vendor Listings

Authors: Thomas Zajkowski, Lloyd Queen, Darrell VanBuren
Presenter: Thomas Zajkowski
USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT

Infrared sensors have been aiding wildland firefighters for nearly 40 years. Originally only used for initial detection IR sensor are now used to detect, monitor, tactical suppression direction, and mop-up operations. Recent technological developments have seen proliferation of IR scanners at fire camps across North America. They range from small handheld units to airborne units that can cover millions of acres per hour with real-time output. Each type of scanner has its proper use and misuse. By classifying IR scanners in to specific type Incident Commanders and Situation Unit Leader will be able to have the proper equipment on hand when it is needed and not waste valuable time and money on imagery that will not be useful. Following the typing scheme used to classify helicopters NIFC and RSAC personnel have devised a scheme that is easy to use and simple to understand for firefighting leaders.

Salon G-I — FIA

The National FIA Remote Sensing Band: Current projects to Map the Nation's Forests.

Author-Presenter: Dennis M. Jacobs
The FIA Remote Sensing Band
USDA Forest Service, SRS, Forest Inventory and Analysis, Starkville, MS

The FIA Remote Sensing Band has been collaborating with RSAC in an effort to aggregate a number of remote sensing and GIS data sources with FIA attributes and produce a set of 250-meter resolution maps for different forestland characteristics of the United States. Background, current efforts, and expected products will be discussed. MODIS was selected as the base imagery for these projects due to the spatial challenges for making maps at the national scale, and a temporal resolution expected to allow repeatability on an annual basis. The background product, which will support all other maps, will be a forest base map. The current map under review is a forest biomass map of forty-nine states and Puerto Rico (no data for Hawaii). The next expected map is a forest-type-groups map: following in the historical tradition of mapping FIA forest types.

How Does MODIS Imagery Correlate with USDA-Forest Service FIA Plot Data?

Author-Presenter: Michael Hoppus
USDA Forest Service, Northeastern Research Station, FIA, Newtown Square, PA

MODIS imagery and derived products are being evaluated for their ability to map, monitor, and estimate forest land in the US. How do the quantitative data provided by MODIS pixels correlate with the forest measurements of the 26,000 forest inventory plots surveyed in the Northeastern US? What affect on the correlations does the discrepancy in size have between the small ground plot (1/6 acre)and the MODIS pixels (15ac, 60ac, and 240ac)? Can FIA plots and the MODIS imagery be used together to improve the precision of the FIA forest area estimates or produce useful spatial maps of forest parameters? Using regression, K-NN techniques and statistical stratification, these questions are answered.

Salon E — Resource Inventory

Overview of the 2001 National Landcover Database and its Applications in Forestry

Authors: Collin Homer, Limin Yang, Mike Coan, Chengquan Huang, Bruce Wylie, Jon DeWitz
Presenter: Collin Homer
EROS Data Center, Sioux Falls, SD

The National Land Cover Database (NLCD 2001) is a nation-wide Landsat based land cover database being created with 9 Federal partners, including the USFS. Components in the database include: (1) normalized 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, and (5) classification rules, confidence estimates and metadata from the land cover classification. NLCD components have many direct applications to USFS requirements including urban forest estimation, FIA precision estimates, fire fuels and land cover mapping. The database is in the production phase, using extensive partnering in the federal government and outsourcing to the private sector to enable planned completion by 2006.

Salon F — Active Fire

High Accuracy Perimeter & Thermal Maps Delivered to the Fire Line in Real Time.

Authors: Timothy Ball, Ryan Dotson, Tom Patterson
Presenter: Timothy Ball
Fireball Information Technologies, LLC, Reno, NV

Situation Awareness is key in fire fighter safety as well as in planning an efficient fire fighting attack. Until Fire Season 2003 fire fighters on the line received maps hours after a fire was flown. Now a Situation Awareness System instantly delivers maps and photographs from our aircraft to PDAs issued to fire fighters and to a Forward-Area Printing System available to Division Supervisors. Accurate, automated image geo-referencing/analysis required to produce maps instantly onboard an aircraft is one of several challenges handled successfully. Incident Managers Teams report that this system accelerates planning and execution by more than 12 hours. Responding quickly to developments on the fire line focuses resources, keeps fires smaller, saves large amounts of money, and increases safety. Video of real-time map delivery to enhance safety on the Grand Prix Incident in Southern California will be shown.

Salon G-I — FIA

Optimal K-Nearest Neighbor Prediction of Forest Stand Volume in the Northeast USA

Authors: Raymond L. Czaplewski, Andrew Lister, Michael Hoppus
Presenter: Raymond L. Czaplewski
USDA Forest Service, Rocky Mountain Research Station, Fort Collins, CO

The k-nearest neighbor (kNN) method is used to map total stand volume for a Landsat scene in New England. Linear regression is used to “optimally” weight geospatial explanatory variables in the sense of least squares. A form of all-possible regressions (Lister et al. 2004) is compared with stepwise multiple regression. Results are also compared to existing applications of kNN in forest mapping that equally weight all explanatory variables. Once the relationship of Euclidian distance in the kNN procedure is made to linear regression, methods are apparent that increase computational efficiency in both kNN model development and application of that model to very large numbers of pixels.

Salon E — Resource Inventory

Fuzzy Recoding for Deconflicting Land Cover Classification

Author-Presenter: Suzie Noble
Leica Geosystems GIS & Mapping, LLC, Englewood, CO

Last year, ERDAS IMAGINE 8.6 introduced the Grouping Tool. This tool improved the efficiency of assigning land use categories to the results of unsupervised image classifications, including helping to identify conflict between category assignments. This presentation will be a combination power point and live demo on how to use the Grouping Tool, as well as the new Fuzzy Recode functionality in IMAGINE 8.7 to accurately assign land use categories. Fuzzy recoding uses confidence weights as well as pixel adjacency effects to best determine the target class for each pixel. ERDAS IMAGINE is the industry leading geographic imaging software and is a product of Leica Geosystems GIS & Mapping, LLC.

Land Cover Classification in the Caribbean Using Machine Learning Techniques

Author-Presenter: Steve Schill
The Nature Conservancy, Richmond, UT

St. Vincent and the Grenandines make up 32 lush volcanic islands and cays with a total land mass of 389 km sq and elevations reaching 1,234 m (Soufriere volcano). The Nature Conservancy is working with the USDA Forest Service and the USGS to develop detailed land use/land cover products for the Caribbean region that will be used in the context of an integrated spatial database for internet map server applications. Methodologies that were used for this project include a) the development of a minimal cloud-cover mosaic of Landsat 6 ETM+ scenes; b) the collection of ground reference data; c) the use of C5 decision tree algorithm to classify land cover, d) manual interpretation of classes that the decision tree was not able to accurately distinguish; e) random accuracy assessment.

Salon F — Pre-Fire

Mapping Relative Fire Regime Condition Class for the Western United States

Authors: James Menakis, Melanie Miller, Wendel Hann
Presenter: James Menakis
USDA Forest Service, Fire Effects Unit, Fire Science Laboratory, RMRS, Missoula, MT

In 1999, a coarse scale map of Fire Regime Condition Classes (FRCC) was developed for the conterminous United States to help address contemporary fire management issues and to quantify changes in fuels from historical conditions. This data has been incorporated into national policies (National Fire Plan, Forest Health Initiative) and GAO reports. While this data has been invaluable for addressing changes in fuels conditions on forestlands, it potential underestimated these conditions for grasslands and shrublands. In order to address these underestimates, we incorporated finer scale remotely sensed data into the process to create a new map of FRCC for the western US. We also relativized the FRCC into blended color ramps that reflect degrees of the departure and conditions over geographic areas. This shading, potentially allows for a more realistic view of FRCC, because it takes into account historical range of variability and compositional differences.

Improving the Conterminous U.S. Greenness Data Set for Fire Danger Monitoring

Authors: Jeff Eidenshink, Brad Reed
Presenter: Jeff Eidenschink
U.S. Geological Survey, Sioux Falls, SD

The U.S. Geological Survey has been monitoring the vegetation condition of the conterminous U.S. and Alaska using Advanced Very High Resolution Radiometer (AVHRR) satellite data for over fifteen years. The time series of weekly and bi-weekly vegetation condition or greenness maps show the annual and interannual patterns of vegetation condition and are used for monitoring fire danger over the vast landscapes and ecosystems in the U.S. The two characteristics that make the data valuable are the length of the time series and the quality of the processing methods. This paper will describe the conterminous U.S. data set, illustrate the use of the time series in fire danger monitoring and fire potential forecasting and illustrate how the AVHRR time series can be used to extend the time of MODIS and future vegetation monitoring missions.

Salon G-I — FIA

Mapping Forest Land Proportion from MODIS Vegetation Continuous Fields Data.

Authors: Mark D. Nelson, Ronald E. McRoberts and Matthew C. Hansen
Presenter: Mark D. Nelson
USDA Forest Service, North Central Station, FIA, St. Paul, MN

The USDA Forest Service's Forest Inventory and Analysis (FIA) program provides data, information, and knowledge about our Nation's forest resources. FIA regional units collect data from field plots and remotely sensed imagery to produce statistical estimates of forest extent (area); volume, growth, and removals; and health and condition. There is increasing need to analyze and display FIA estimates within a geospatial context. A nationwide map of forest land would provide the basis for mapping FIA attributes. Forest land maps can be derived from existing satellite products, but these maps are inconsistent with FIA estimates of forest land area, especially within smaller geographic areas. We describe an approach for segmenting and calibrating MODIS Vegetation Continuous Fields (VCF) data to produce a map of forest land proportion that provides unbiased estimates of forest land area compared to FIA estimates across multiple spatial scales. We compare precision of FIA estimates with VCF-derived estimates.

Spatial Control of Legacy FIA Ground Plot Data in Interior Alaska

Author-Presenter: Ken Winterberger
USDA Forest Service, PNW Research Station, Anchorage Forestry Sciences Lab, FIA, Anchorage, AK

Forest Inventory and Analysis ground plots in Alaska collected prior to the mid-1990s were 'located' in the field based on their depiction on aerial photography. Before the advent of GIS and GPS this lack of spatial information was not a problem. Recently, accurate plot coordinates have become very important for correlating known ground conditions with current remotely sensed data and other spatially explicit information. Revisiting ground plots in interior Alaska to collect GPS-based plot coordinates is virtually impossible. A method of transferring aerial-photo-based plot location to rectified satellite data was developed and tested. The methodology and results are described. Several uses for the legacy plot coordinates are discussed. Issues related the correlation of data with variable spatial accuracy is considered.

Salon E — Resource Inventory

Automated Delineation and Attribution of Forest Stands From High-Spatial Resolution Remote Sensing Data

Authors: Norm Roller, John Colwell, Eli Rodemaker
Presenter: Norm Roller
Marshall and Associates, Inc., Olympia, WA

Procedures have been developed to automatically delineate forest stand polygons with a minimum size mapping unit that correspond well to forest stands that would be drawn by an experienced interpreter. Input data consists of spectral-spatial-contextual metrics related to important attributes of the forest. An additional procedure computes average values for the polygons/stands for useful forest attributes, like crown cover and relative tree size. Stands may then be formed into strata on the basis of the similarity of their average collective attributes. The software also automatically creates a GIS compatible vector database with attributes. Useful results have been obtained with a wide range of high-spatial resolution data types, including SPOT 5 panchromatic and multispectral data, DAIS multispectral data, and both panchromatic and color-infrared DOQQs. The potential for using DOQQs for automatic mapping and stand attribution may make this approach very cost-effective, and therefore especially attractive to potential users.

Salon F — Pre-Fire

Evaluating the ASTER Sensor for Mapping and Characterizing Forest Fire Fuels in Northern Idaho

Authors: Michael Falkowski, Paul Gessler, Penny Morgan, Andrew Hudak
Presenter: Michael Falkowski
University of Idaho, Moscow, ID

In order to utilize monies from the National Fire Plan efficiently, Land managers need cost-effective methods for mapping and characterizing fire fuels quickly and accurately. The advent of sensors with increased spatial resolution may improve the accuracy and reduce the cost of fuels mapping. The objective of this research was to evaluate the accuracy and utility of the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) satellite imagery and gradient modeling for mapping fuels for fire behavior modeling within FARSITE. An empirical model, based upon field data and spectral information from an ASTER image, was employed to test the efficacy of ASTER for mapping and characterizing canopy closure and crown bulk density. Surface fuel models (NFFL 1-13) were mapped based upon unique combinations potential vegetation type, cover type (classified from the ASTER image), and structural stage (classified from the ASTER image).

Salon G-I — FIA

Forest Type Mapping of Arizona, New Mexico, and Wyoming

Authors: Bonnie Ruefenacht, Gretchen Moisen and Jock A. Blackard
Presenter: Bonnie Ruefenacht
USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT

This paper develops techniques for the mapping of forest types in Arizona, New Mexico, and Wyoming. The methods involve regression-tree modeling using a variety of remote sensing and GIS layers along with Forest Inventory Analysis (FIA) point data. Regression-tree modeling is a fast and efficient technique of estimating variables for large data sets with high accuracy levels. If the methods developed in this paper are successful, they will be applied to the contiguous United States and Alaska producing a forest type map for these areas. This forest type map will update and improve an older version of the forest type map made in 1992.

Salon E — Resource Inventory

Using IKONOS Imagery to Distinguish Five Hardwood Trees in South-Central Indiana

Authors: Dale R. Weigel, Craig Wayson
Presenter: Dale R. Weigel
USDA Forest Service, North Central Research Station, Bedford, IN

Landsat TM imagery has long been used for forest cover type mapping with its major limitation being a 30-meter pixel size. This has made it very difficult to distinguish individual hardwood tree species. With the launch of Space Imaging's IKONOS satellite providing 1-meter panchromatic and 4-meter multispectral images this limitation has been removed. Three IKONOS images, summer 2001, fall 2001, and spring 2002 were obtained for the Pleasant Run Unit of the Hoosier National Forest in south-central Indiana. The five most dominant hardwood trees in south-central Indiana were selected for analysis. In the field, approximately 30 tree bole locations and crown areas per species were obtained using a GPS receiver. This provided training samples for the five species. We will report initial analysis for the five tree species including spectral response of the individual species and potential aspect response differences.

The Use of MODIS Products in a Geospatial Decision Support Tool for Rangeland Monitoring

Authors: Willem van Leeuwen, Barron Orr, Stuart E. Marsh, Grant Casady, Laura Baker, Elisabeth vander Leeuw. Charles F. Hutchinson
Presenter: Willem van Leeuwen
University of Arizona, Tucson, AZ

RangeView (http://rangeview.arizona.edu) is a web based geospatial application for viewing, animating, and analyzing multitemporal satellite and precipitation data to permit monitoring of vegetation dynamics through time and across landscapes. RangeView has been developed for natural resource managers but also has significant value for educators and researchers. MODIS (Moderate Resolution Imaging Spectroradiometer) derived products have been developed and integrated into the RangeView website to facilitate monitoring and interpretation of vegetation growth, drought and wildfire dynamics. The MODIS derived products include spectral vegetation indices (250m and 1km resolution) and associated cloud and snow cover data. A color composite image is also provided to help assess the quality of the NDVI (Normalized Difference Vegetation Index) data. The MODIS derived Leaf Area Index is provided as an additional indicator of live vegetation. Demonstration of the successful complementary use of these products as a tool for rangeland monitoring will be presented.

Salon F — Pre-Fire

The Use of QuickBird Satellite Imagery to Define the Wildland Urban Interface and Determine Hazardous Fuel Treatment Priorities

Author-Presenter: Skip Edel
Colorado State Forest Service, Denver, CO

The presentation will describe a project funded by the Colorado State Forest Service and carried out by Digital Globe and Native Communities Development Corporation (NCDC) to assess the Wildland Urban Interface around Bailey Colorado. The purpose of the project was to survey the Wildland Urban Interface in an area of high fire risk using the newest remote sensing technologies. The Bailey area has been impacted by four large fires in the last eight years. During the course of the project NCDC utilized Quick Bird satellite imagery to map structure locations and roof compositions for 14,000 structures, determined priority fuel treatment stands, and mapped escape routes and safety zones, as part of their assessment of wildfire risk. Mapping of structure locations allowed a very accurate definition of the Willand Urban Interface, while mapping and prioritization of high density timber stands provides foresters a tool to utilize scarce mitigation resources most wisely.

Enhancement of a Firewise Program with Geospatial Data, Assessment, and Analysis

Author-Presenter: Tom Eiber
Minnesota Division of Forestry, Fire Management Section, St. Paul, MN

Minnesota has over 500 communities at direct risk from wildfire. To be effective, our risk mitigation program, a.k.a. Firewise, must work to mitigate diverse risk factors that exist within the local community. The cornerstone of any community-based project is good information about fuels, topography, and threatened infrastructure. Minnesota's Firewise program provides key fire data to local communities and a standardized protocol for gathering critical infrastructure data and planning as a prelude to active mitigation. Basic fire data provided includes cover type and land use, fuel/behavior models, topography, fire history, population and road density, fire service infrastructure, and generalized risk. Fuel and cover data are based on GAP/satellite data processed to enhanced GAP standards. Census and highway information is modeled into a density surface similar to the USGS DEM and its topographic derivatives. This statewide information is spatially processed and with other information such as structure location and risk for the community.

Salon G-I — FIA

Small Area Estimation in Forests Affected by Wildfire

Authors: Gretchen Moisen, Jock Blackard, Mark Finco
Presenter: Gretchen Moisen
USDA Forest Service, Rocky Mountain Research Station, FIA, Ogden, UT

Recent emphasis has been placed on estimating amount and characteristics of forests affected by wildfire in the Interior West. Data collected by FIA is intended for estimation over large geographic areas and is too sparse to construct sufficiently precise estimates of affected forests within burn perimeters. This paper illustrates how recently built MODIS-based maps of forest type and biomass can be used to produce estimates within small geographic areas. FIA-collected forest attributes were modeled as functions of 250 m resolution digital ancillary variables using nonparametric tree-based methods, and maps built over diverse ecological mapping zones. A composite estimation approach was applied to balance the potential bias of synthetic estimates (generated solely from the maps) against the instability of a direct estimator (generated from small numbers of FIA plots). Methods are described and illustrated through applications to fires occurring in the last two years.

The Uses of Regression-trees in Remote Sensing

Author-Presenter: Bonnie Ruefenacht
USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT

Regression-tree classification is a relatively new procedure for land cover classification. Regression-tree classification procedures have several advantages over more traditional classification procedures. Regression-trees are non-parametric and, as such, do not require knowledge about data distributions and can handle non-linear relationships between variables. They can also allow for missing data values, handle both numerical and categorical data, and incorporate multiple remote sensing and GIS data layers. Regression-tree classifications are significantly less labor intensive than other classification techniques and can be used efficiently for large land cover classifications. Accuracies of regression-tree classifications are either similar to or better than supervised/unsupervised classification. Using regression-tree software packages Cubist and See5, the USDA Forest Service Remote Sensing Applications Center developed applications for the elimination of clouds from imagery, derivation of percent cover layers, and classification of imagery. These applications consist of easy-to-use graphical-user-interface programs developed within ERDAS Imagine.

Salon E — Resource Inventory

Using QuickBird Satellite Imagery to Distinguish Two Noxious Weeds in Southern Texas

Authors: James H. Everitt, Chenghai Yang
Presenter: James H. Everitt
USDA-ARS, Weslaco, TX

Giant reed (Arundo donax L.) and spiny aster [Leucosyris spinosus (Beaty.) Greene] are two noxious weeds that invade wetland and riparian sites. QuickBird high resolution (2.8 m) multispectral satellite imagery was evaluated for distinguishing giant reed and spiny aster infestations in southern Texas. The satellite sensors consisted of the blue (450 to 520-nm), green (520 to 600-nm), red (630 to 690-nm), and near-infrared (760 to 900-nm) bands. Field reflectance measurements made on giant reed and spiny aster showed they had distinct spectral characteristics. Unsupervised classification techniques were used to classify false color composite images of study sites. Accuracy assessments performed on the classified maps of study sites showed that both giant reed and spiny aster had producer's and user's accuracies greater than 80%. These results indicate that QuickBird imagery can be a useful tool for distinguishing infestations of these two troublesome weeds.

Supermaps from High Spatial Resolution Satellite Imagery for Vegetation Mapping and Monitoring

Authors: Sam Drake, Hugo Rodriguez, Andy Hubbard
Presenter: Sam Drake
Arizona Remote Sensing Center, Tucson, AZ

With ground pixel resolution of 1 meter or finer, currently available imagery from the IKONOS and QuickBird sensors can overcome many of the limitations to interpretation of land cover created by larger, mostly mixed, pixels. However, such small pixels present new problems for traditional image classification-based mapping of spatially extensive features such as vegetation types. We have combined visual interpretation and field mapping methods with image classification techniques and vector GIS to map vegetation in Sonoran Desert network national parks. Results show that the concept of a multi-layer "supermap", combining different raster and vector layers and multitemporal views, is more useful for management and monitoring than any single map layer. Overlays of multi-date imagery can be directly interpreted for detailed monitoring of vegetation change by park resource managers not expert in image processing.

Salon F — Pre-Fire

Mapping Fuels and Fires in Southern California Chaparral Using Hyperspectral Remote Sensing

Authors: Philip E. Dennison, Dar A. Roberts, Robert O. Green, Jennifer L. Rechel, Seth Peterson, Charles Jones
Presenter: Philip E. Dennison
University of California Santa Barbara, Santa Barbara, CA

Coastal Southern California possesses a combination of residential development, fire-adapted chaparral vegetation, and regional meteorology that all contribute to high fire hazard. Characterizing fuels and fire behavior is critical for determining wildfire danger in this wildland-urban interface. Hyperspectral data allow spectral characterization of surface materials, permitting detailed analysis of fuel properties. Two Airborne Visible Infrared Imaging Spectrometer (AVIRIS) time series acquired in Southern California are being used to map fuel type to the species level, fuel moisture, and fuel condition. These fuel properties, combined with a mesoscale meteorological model, are being used to simulate wildfire events. Recent fires in Southern California demonstrated that hyperspectral data can also be used to estimate flame temperature by measuring the spectral shape of the energy emitted by combustion. Moderate Resolution Imaging Spectrometer (MODIS) data are being used to “scale-up” measures of fuel properties.

Laser Altimetry Derived Canopy Fuel Data Products for the Black Hills Experimental Forest, South Dakota.

Authors: Eric Rowell, Lee Vierling, Wayne Sheppard
Presenter: Eric Rowell
South Dakota School of Mines and Technology, Rapid City, SD

South Dakota School of Mines and Technology, Rapid City, SD
Current methods of characterizing canopy fuels use a combination of aerial photo interpretation and/or satellite imagery and require extensive field data to produce canopy fuel measurements that can be time consuming and slow to result in a mapping product. Laser altimetry (lidar) derived canopy fuel measurements allow for expeditious generation of canopy fuels maps over a large spatial extent. Discrete return lidar accurately models vertical biomass distribution by sampling foliar and woody material through the forest canopy and understory. These models are used to generate biophysical estimates of canopy fuel components. Results from a comparison between lidar and field data collected within the Black Hills Experimental Forest (BHEF), demonstrates that lidar accurately estimates biophysical measurements as canopy base height, canopy height, and crown diameter. The field validated biophysical measurements are used to generate a lidar derived crown bulk density map, filling a current data void for the BHEF.

Salon G-I — FIA

Forest Vigor Assessment of the Inland Northwest Using Landsat Time-Series

Authors: Russell Beck, Paul Gessler
Presenter: Russell Beck
Department of Forest Resources, Moscow, ID

The Inland Northwest US contains extensive areas of complex, inaccessible terrain requiring significant resource expenditure for forest inventory and assessment. Cost effective methods are necessary for regular assessment of forest vigor over complex terrain. Satellite derived vegetation indices such as the normalized difference vegetation index (NDVI) can monitor large remote areas with an effective database for evaluating vegetation vigor. This paper proposes new methods for mapping and monitoring forest status through the creation of a departure from normal NDVI map derived from an expanding time-series of Landsat imagery. The time-series was geometrically and radiometrically corrected and image-to-image registered to support pixel level analyses. NDVI was derived for each scene and a long-term average was calculated for use in deriving departure for any year or series of years in the time-series. Methods for displaying negative and positive departures will be presented and evaluated for significance in support of forestland management.

Modeling investigations into Mapping of Rorest Attributes With FIA Data for the State of Wyoming

Authors: Jock A. Blackard, Gretchen G. Moisen, Ronald P. Tymcio
Presenter: Jock A. Blackard
USDA Forest Service, RMRS, FIA, Ogden, UT

Several forest attributes were recently mapped for the state of Wyoming using FIA data and MODIS imagery. Modeling investigations were focused on issues related to a hierarchical modeling process. Some of these issues included 1) determine the “best” cost functions to use in creating forest masks, 2) explore the benefits of using predicted forest type as a predictor in models of biomass, and 3) compare the performance of models for other continuous forest attributes such as stand age, size and volume. Accuracy assessments derived from modeling investigations were performed on independent test sets.

Salon E — Resource Inventory

Timber Stand Delineation and Stocking Differentiation using High-Resolution Imagery

Authors: Matt Vernier, Andrew Brenner, Jim Smith
Presenter: Julie Coen
Space Imaging, Salt Lake City, UT

"Cruising Timber" is a necessary part of the timber industry, and is time-consuming and expensive. Space Imaging was contracted to develop an automated procedure to delineate pine stands and to measure their stocking levels from airborne imagery. The goal was to compare automated classifications with previously digitized boundaries and recent cruise data. eCognition (Definiens Imaging) held the greatest promise for producing a satisfactory result, with the ability to segment the image at multiple resolutions. This lends itself to timber stand analysis by classifying individual trees or tree clumps at a small scale, and aggregating to a larger scale in a relative area analysis. Subsequently, relative area statistics are used to classify land areas into stocking categories. The larger-scale polygons are then merged with like polygons to produce a boundary and stocking layer. Preliminary results show that the products and methodology could produce a significant savings in time and expenditures.

Salon F — Active Fire

A Hybrid Contextual Fire Detection Algorithm Using MODIS Imagery

Authors: Ying Li, Ying Li, Anthony Vodacek, Robert L. Kremens, Ambrose Ononye
Presenter: Ying Li
Rochester Institude of Technology, Rochester, NY

There is active interest in the development of algorithms for global wildland fire detection using satellite sensors such as the Moderate Resolution Imaging Spectroradiometer (MODIS). We describe a contextual fire detection algorithm for global fire detection using MODIS imagery. This algorithm is a hybrid of our pattern recognition approach incorporating the Mahalanobis distance, the MODIS fire detection algorithm, and the MODVOLC algorithm. The hybrid algorithm takes advantage of the strong points of each algorithm and circumvents the weaknesses to maintain high fire discrimination capabilities, adaptability to different geographic areas and observation conditions, and relatively simple mathematics. The algorithm was tested using MODIS images obtained for different parts of the world at different times. The results display the flexibility of the new algorithm in having a high detection probability and low false alarm rate.

Salon G-I — State / Federal Panel

The Forest Service and the nation's states, in particular State Forestry Organizations (SFOs), share many common goals, issues, needs, challenges, constituencies, and opportunities. Such common concerns exist at policy and program levels, but also in terms of the development and use of geographic or geospatial information and technology (GIT), including remote sensing, GIS and GPS. Forest Service leaders and State Foresters meet regularly to address common matters at a policy level, and federal and state forestry program leaders interact frequently about related work. Many benefits are realized through such continuing dialogue. However, a communication mechanism does not exist to enable GIT staff in the Forest Service and the SFOs to become acquainted or work together. An important opportunity exists at this conference to facilitate communication and future coordination because representatives of approximately a third of the SFOs are in attendance. The conference program includes several SFO presentations and posters to inform attendees about state projects.

This panel uniquely provides a forum for Forest Service and state representatives to learn from each other, and identify and explore many common issues and needs. Suggestions are being solicited for additional discussion topics, but current ideas include (1) approaches to share data, including both public and private resources, (2) lessons learned from and new opportunities for joint projects, (3) advanced technology projects with universities and others, and (4) emerging data access approaches. Other opportunities to share technology, expertise and training programs, and work with others such as local governments, can be discussed. In addition, members of the panel and the audience will discuss potential approaches for future communication, coordination and mutual benefits.

Salon E — Resource Inventory

Use of Orthorectified Aerial Photography to Assess the Degree and Extent of Ice Storm Damage

Authors: Jeffrey F. Lewis, William Luhn
Presenter: Jeffrey F. Lewis
USDA Forest Service, Morehead Ranger District, Daniel Boone NF, Morehead, KY

In February 2003, a winter storm deposited up to two inches of ice across most of eastern Kentucky. The ice coated trees and other surfaces for close to 24 hours. This covering of ice caused significant damage to the forests of eastern Kentucky through crown breakage and uprooting. Aerial photography taken following the storm, was orthorectiifed and used to determione the degree and extent of damage to a portion of Rowan County, Kentucky. The paper will present the process used to prepare the photography for use, the methods used to identify and classify damage, and provide some evidence as to the accuracy of the work.

Detailed Imagery for Projects

Authors: Jim Schramek, Susan Wise-Eagle
Presenter: Jim Schramek
USDA Forest Service, Tongass National Forest, Petersburg, AK

The Temperate Rainforest of the Tongass hides important landscape features, causing the requirement to update existing GIS data with better detail to include ground features requiring management consideration. One means to accomplish this is through use of more detailed imagery. The Tongass has 17 million acres spread over an area larger that 35 million acres. There are 11 districts, and there are portions of the Supervisors office in 3 towns. Personnel needing access to data for the entire forest are at most of these sites. New capabilities in image processing offer great opportunities to fill data gaps. Aeria photos are scanned and processed to create color digital orthos for projects. The paper focuses on challenges in creating, as well as managing these images for consistent use on the forest.

Salon F — Active Fire

Integration of Surface Weather Observations with MODIS Imagery for Fire Weather Applications

Authors: John Horel, Mike Splitt
Presenter: John Horel
NOAA Cooperative Institute for Regional Prediction, Salt Lake City, UT

The Real-time Observation Monitor and Analysis Network (ROMAN) has been developed to provide real-time surface weather data to meteorologists and land managers in the United States of America who deal with wildland fire. ROMAN is a web-based system designed to provide access to weather observations from a large number of networks across the United States. The interface is intuitive, interactive, and dynamic. The software is designed to be accessible to the wide range of fire professionals requiring observational data, from the top levels managers using high speed networks to the fire behavior analyst in the field using a slow dial-up connection. As part of the ROMAN software, weather observations are integrated with regional MODIS maps of active fires to provide the user with weather information in the vicinity of major fires. See www.met.utah.edu/roman for further details. Applications of ROMAN are illustrated using the fire outbreak in southern California during October 2003.

National Agricultural Imagery Program Overview

Author-Presenter: Geoff Gabbott
USDA FAS Aerial Photography Field Office, Salt Lake City, UT

The National Agricultural Imagery Program (NAIP) acquires digital ortho imagery during the agricultural growing seasons in the continental U.S. A primary goal of the NAIP program is to enable availability of ortho imagery within a year of acquisition. NAIP provides two main products: 1 meter ground sample distance (GSD) ortho imagery rectified to a horizontal accuracy of within +/- 3 meters of reference digital ortho quarter quads (DOQQs) from the National Digital Ortho Program (NDOP); and, 2 meter GSD ortho imagery rectified to within +/- 10 meters of reference DOQQs. While NAIP is primarily focused on the agricultural regions of the nation, opportunities exist for expanding coverage with cost-share partnerships.

Salon E — Resource Inventory

Drought Monitoring through the Use of MODIS Satellite Data

Authors: Amy Anderson, Curt Johnson, Dave Prevedel, Russ Reading
Presenter: Amy Anderson
USDA Forest Service, Intermountain Region, Ogden, UT

With limited USDA Forest Service personnel available to monitor rangeland vegetation conditions, it has been difficult to determine when livestock should be moved due to vegetative drought related stress. A tool was required to determine where limited field monitoring time should be spent for livestock permit administration within the Intermountain Region. The tool that has been developed involves collecting data from MODIS satellite imagery and processing with automated scripts for image analysis. The resulting stress indices are a product of the amount of green growing material in plants; subsequent comparison of products over time yield a representation of trends and total growing plant biomass. Any reduction of biomass over time may be attributed to a combination of factors, such as plant phenology, plant moisture content, and livestock grazing. The tangible benefit to the Forest Service and its grazing permittees is an immediate method to monitor and assess vegetation stress.

Salon F — Active Fire

Remote Image and Field Data Collection for a Dynamic Fire Modeling System

Authors: Anthony Vodacek, Robert Kremens, Ambrose Ononye, Jason Faulring
Presenter: Anthony Vodacek
Rochester Institute of Technology, Rochester, NY

Development of a dynamic realtime wildland fire model will require a system for delivering pertinent field data to both force and validate the fire propagation model. The field data can be acquired with ground sensors or from aircraft or even satellite sensors. Systems for collecting and analyzing weather data or infrared images, for example, must be simple and robust if they can be expected to operate in a near realtime fashion. This paper explores the timelines and data formats of various data collection systems to assess the current bottlenecks and points of failure for delivering information to the model, with an emphasis on image data.

Salon G-I — Tech Track

Softcopy Photogrammetry with Leica Photogrammety Suite

Presenter: Ben Dorland
Leica Geosystems GIS and Mapping, Englewood, CO

The Leica Photogrammetry Suite (LPS) is a seamlessly integrated suite of digital photogrammetry products that empowers users to transform raw imagery into reliable data layers required for all digital mapping, GIS analysis and 3D visualization. LPS is fully compatible with Leica Geosystems' flagship geographic imaging software suite, ERDAS IMAGINE® 8.7. LPS is the first step in Leica Geosystems' next generation products that streamline workflow from data capture through finished data. This presentation will introduce the audience to the benefits of LPS.

Salon E — Resource Inventory

The Kentucky Landscape Snapshot Project

Authors: Bill Luhn, Roy Boggs
Presenter: Bill Luhn
USDA Forest Service, Region 8, Daniel Boone National Forest, Winchester, KY

The Kentucky Governor's Office for Technology was awarded a $1.3 million grant from the National Aeronautics and Space Administration (NASA) in December 2001, to fund the Kentucky Landscape Snapshot (KLS) Project. The Daniel Boone National Forest and Kentucky Division of Forestry are partners on the project. Deliverables from the KLS project are: • Updated Anderson Level II statewide landcover map • Forest-cover map Anderson Level III (with R&D to level IV) • Stratified forest inventory • Attempt to push a forest classification scheme to a level IV scheme using ancillary data, local forest and ecological knowledge • High-resolution landcover map for 2 counties/8 urban areas within the counties • A set of very useful tools for decision makers and land planners This presentation will offer a synopsis of the data products and software applications to be released, and examples of their impact on federal, state and local governments.

Assessing Forest Carbon Stock/Flux with TM Imagery and FIA Data in Coastal Virginia in Support of a Carbon Sequestration Project

Author-Presenter: John A. Scrivani
Virginia Dept of Forestry, Charlottesville, VA

Landsat TM images were classified for five dates from 1988 to 2001 for over 3 million acres of Virginia's coastal plain. The five classifications were stacked to produce classes representing history of land use. This history was used to identify areas of afforestation, reforestation or deforestation, (ARD) according to IPCC definitions. Areas of agricultural use that did not fall within the deforestation category of the ARD image were identified as potential candidates for afforestation. Estimates of land use change, harvest rates and timber removals, were compared with estimates obtained for the same area from FIA surveys. A carbon balance was computed for the area and issues of additionality and leakage were addressed. The project demonstrated the feasibility of combining multi-date TM image classifications with FIA field data, to estimate carbon stocks, flux and the potential for effective carbon sequestration programs in a sub-state region.

Salon F — Active Fire

Modeling Wildland Fire with DIRSIG

Authors: Zhen Wang, Anthony Vodacek, Robert Kremens, Ambrose Ononye
Presenter: Zhen Wang
Imaging Science at Rochester Institute of Technology, Rochester, NY

The object of this paper is to describe the utility of the Coupled Atmosphere-Fire Model to represent the finescale dynamics of convective processes in a wildland fire for visualization within the synthetic image generation model DIRSIG. The fire model output can be used to create geometric data for input to DIRSIG to create realistic looking flames. The first step in the simulation is to produce three-dimensional, time-dependent files describing the fire evolution and its interaction with the environment. Then these grid-based heat fluxes and buoyancies can be imported into DIRSIG, but must be transformed into the spectral emission of a wildland fire in order for DIRSIG to run the ray-tracing model. Our goal is to produce realistic flame structures and realistic spectral emission across the visible and infrared spectrum.

Automatic Estimation of Direction of Propagation of Fire From Aerial Imagery

Authors: Anthony Vodacek, Ambrose Ononye, Zhen Wang, Ying Li
Presenter: Anthony Vodack
Rochester Institute of Technology, Rochester, NY

BEHAVE and FARSITE are tools being used to predict the dynamic propagation of wildland fire based on a set of input parameters that must be known a priori. Their use is limited when the fire scene parameters are not immediately known. The research that led to the BEHAVE model has shown that the contour of a fire front is elliptic when viewed from a remote platform. By exploiting this shape property and employing the tools developed from differential geometry, we suggest a method for determining direction and relative speed of a fire front based solely on a single 2D remote image. This technique may be useful to quickly generate a fire map dynamics for dissemination to fire managers in situations where continual aerial monitoring is not possible. Results for this approach using AVIRIS data sets are presented.

Salon G-I — Tech Transfer

What's New in IMAGINE 8.7

Presenter: Suzie Noble
Leica Geosystems GIS and Mapping, Englewood, CO

Leica Geosystems is pleased to announce that ERDAS IMAGINE® V8.7, the industry's premier geographic imaging suite, is now shipping worldwide. The latest version of ERDAS IMAGINE features JPEG2000 support (including GeoJP2), improvements to its mosaic tool and a faster, smoother multi-threaded IMAGINE Geospatial Light Table™ (GLT) viewer. The concentration of this presentation will be the new features that have been added in IMAGINE 8.7

Image Processing in ArcGIS: Imagine Analysis for ArcGIS

Presenter: Ben Dorland
Leica Geosystems GIS and Mapping, Englewood, CO

The presentation will discuss the new extension, Image Analysis for ARCGIS. Image Analysis for ArcGIS is the GIS professional's all-in-one image processing software package for preparing and creating 'GIS-ready' images. It allows the GIS professional to extract and analyze spatial and non-spatial information from imagery.

Salon E — Resource Inventory

Ground-based Remote Sensing with Long Lens Video Camera for Upper-stem Diameter and Other Tree Crown Measurements

Authors: Neil Clark, Sang-Mook Lee
Presenter: Neil Clark
USDA Forest Service, Southern Research Station, 4702, Blacksburg, VA

This paper demonstrates how a digital video camera with a long lens can be used with pulse laser ranging in order to collect very large-scale tree crown measurements. The long focal length of the camera lens provides the magnification required for precise viewing of distant points with the trade-off of spatial coverage. Multiple video frames are mosaicked into a single super-resolution image to increase the spatial coverage. Upper-stem diameters are the examples given here, but the technique may be generalized to other dimensions of interest.

Large-Area Remote Sensing via Large Numbers of Airborne Sensors

Authors: James Kain, Mark Brennan
Presenter: James Kain
GeoVantage, Inc., Swampscott, MA

Acquisition of accurate and timely high-resolution imagery over large areas for forest and natural resource management can be challenging. Using 22 sensors distributed around the United States, GeoVantage provides 4-band, digital, orthorectified natural color and color infrared mosaiced imagery for forestry applications including: stand inventory, depletion mapping, change detection, and damage assessment. The firm has adopted a unique solution integrating a 4 camera sensor with navigation system that mounts externally to commonly available single engine aircraft. Fielding multiple sensors to cover large areas is an effective and reliable solution for large area forest coverage. Processing of digital frames is readily automated and yields highly accurate orthorectified imagery products. Weather and cloud issues are less due to lower flight altitudes and the distributed nature of the collection activities. Single-point failures and response times are reduced because of our sensor fleet size and over 30,000 aircraft are available throughout the U.S.

Salon F — Post-Fire

Advanced Airborne Fire Mapping System: a NASA Small Business Innovative Research Project

Author-Presenter: John M. Green
Sensytech Imaging Group, Ann Arbor, MI

An advanced airborne fire detection/mapping system currently being developed under a NASA Small Business Innovative Research grant will be presented. The system includes a multi-band imaging sensor, position and attitude sensor, data processing system, and an air to ground data communication link. The sensor incorporates high performance Quantum Well Infrared Photo-detectors (QWIPs) and a lightweight scanner combining high spatial resolution and a wide field of view. The data system incorporates fire detection and classification algorithms to identify hot spots, measure fire temperatures and fuel availability. Position, attitude, topography, and processed imagery will be combined in real time to produce orthorectified GIS compatible fire and terrain imagery. During the project we will survey personnel from the U.S. Forest Service, NASA, and other organizations involved in fire management and research to determine required and desired system performance and to solicit ideas for improvements on the concept.

Accuracy Assessment of Burned Area Reflectance Classification (BARC) and Other Mapping Methodologies for the Purpose of Rapid Response

Authors: Andrew T. Hudak, Penny Morgan, Pete Robichaud, Jess Clark, Keith Lannom
Presenter: Andrew T. Hudak
USDA Forest Service, Rocky Mountain Research Station, Moscow, ID

The USFS Remote Sensing Applications Center (RSAC) and the USGS EROS Data Center (EDC) produce Burned Area Reflectance Classification (BARC) maps for use by Burned Area Emergency Rehabilitation (BAER) teams in rapid response to wildfires. Due to the problems with Landsat 7, there is a need to standardize a BARC mapping method that can be applied to several types of satellite imagery. We will compare several common image processing methods that could be used to quickly produce BARC maps from satellite imagery, including the delta Normalized Burn Ratio (dNBR), and principal components and tasseled cap transformations. In addition, we will assess mapping accuracy using ground truth data from 35 field sites, sampled post-fire across the full range of fire severities observed, for four wildfires in western Montana (Black Mountain II, Cooney Ridge, Robert, and Wedge Canyon Fires) and two in southern California (Old and Simi Fires).

Salon G-I — Tech Track

3D Feature Collection in ArcGIS: Stereo Analyst for ArcGIS

Presenter: Suzie Noble
Leica Geosystems GIS and Mapping, Englewood, CO

Leica Geosystems introduces Stereo Analyst for ArcGIS. This innovative new tool gives GIS professionals the opportunity to convert 2D imagery to reliable 3D information. This is the first stereo feature collection product entirely built on a GIS, for a GIS, to feed a GIS.

Geoprocessing in ArcGIS 9.0

Presenter: Tim Clark
ESRI, Broomfield, CO

This presentation will demonstrate the Geoprocessing Framework in ArcGIS 9.0

Salon E — Resource Inventory

Remote Sensing of Landscape-Level Foliar Moisture Using SWIR Reflectance and Principal Components

Authors: Michael Toomey, Lee Vierling
Presenter: Michael Toomey
South Dakota School of Mines and Technology, Institute of Atmospheric Sciences, Rapid City, SD

The potential of five shortwave infrared (SWIR)-derived indices and principal component analysis (PCA) for estimating landscape-level foliar moisture in a Pinus ponderosa ecosystem has been assessed. Comparisons between Landsat 5 images and in situ calculations of the site moisture concentration (SMC; mass of foliar water per unit area) revealed that the Normalized Difference Infrared Index (NDII), with a two-fold weighting of the NIR reflectance, exhibited the strongest correlation with ground data (r2=0.627). Dense cover of understory grasses produced unusually high index values, due to NIR scattering and efficient SWIR absorption. The second Principal Component exhibited the strongest correlation with SMC (r2=0.765). PCA is data dependent; hence, the weighted NDII is more practical for fire potential and ecosystem monitoring.

Salon F — Post-Fire

An Approach To Burn Area Mapping Utilizing MODIS Imagery

Authors: Brad Quayle, Mark Finco
Presenter: Brad Quayle
USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT

Comprehensive burn area data in a geospatial format are important for regional and national level resource management, policy and research applications. Several factors currently limit the ability to compile synoptic burn area geospatial data for use at regional and national scales. These factors include inconsistent delineation methodologies and data sources. Satellite-based remote sensing has proven to be an excellent tool for mapping burn areas at both coarse and fine scales. This paper presents a remote sensing approach for mapping burn areas appropriate for the specified objective. The method uses daily MODIS multispectral image data available from the Remote Sensing Application Center's (RSAC) MODIS Direct Readout station, and builds off the existing 1-kilometer resolution active fire detections produced by RSAC's MODIS Active Fire Mapping Program. The 1-kilometer detections are used to focus a classification of burn areas using the higher resolution multispectral imagery available from MODIS.

Salon G-I — Tech Track

Managing Raster data In ArcSDE 9.0

Presenter: Tim Clark
ESRI, Broomfield, CO

This presentation will outline what's new for managing raster data in a geodatabase using ArcGIS 9.0. ESRI will present and demonstrate new functionality for raster catalog management in ArcSDE.

Salon E — Resource Inventory

Wildland Fire and Riparian Areas: Identifying Criteria Influencing Riparian Area Resistance to High Intensity Wildfire

Authors: Lynn M. Decker, Haans Fisk, Kevin Megown
Presenter: Lynn M. Decker
USDA Forest Service, Watershed, Fish and Wildlife Staff, Salt Lake City, UT

This project answered whether riparian areas burn as hot as upland areas and investigated environmental factors that make riparian areas susceptible to burning. Four large fires in the Western United States in 2002 created the analysis area for the project. This application combined the use of standard geospatial datasets, topographic and hydrologic modeling, and pixel-based statistical analysis. A practical and repeatable process was developed for assessing burns inside and outside riparian areas. The results of this project indicated that: 1) riparian areas burn less hot than upslope environments; 2) while riparian areas burn less hot, riparian burn values relate positively to upslope burn values; and 3) lower-order stream environments burn more like upslope areas, and as stream order increases, riparian area fires become less hot. The results of this study allow resource specialists to establish baseline data for future fuels planning, environmental analysis, and consultation under the Endangered Species Act.

Using Remote Sensing and Geospatial Technology to Assist the Field Forester in Monitoring Forest Legacy Conservation Easements

Authors: Steven A. Sader, Jacob Metzler, Frank Reed, Sherman Small
Presenter: Steven A. Sader
University of Maine, Orono, ME

One of the most familiar uses of remotely sensed data in forestry is stratification to improve field sampling efficiency. This approach has been recently applied to monitor use restrictions on large working-forest conservation easements (WFCE). The geospatial tools include time-series Landsat imagery, scanned aerial photography, DOQs, forest management plans and GPS data. Monitoring begins with satellite change detection to stratify forest change versus no change areas. The changed areas of interest are further stratified by overlaying GPS locations of important features and forest management polygons on the images. If closer inspection is needed to identify the type of change, recent aerial photos are checked or hand - held digital aerial photography from light aircraft may be acquired. The forester uses Arc-View to display the change detection images, scanned air photos and GPS locations in the office or with a laptop in the field. The remote sensing and other spatial data improve the cost-efficiency of the monitoring and assist the forester to route in the field.

Salon F — Post-Fire

Remote Sensing Imagery Support for Burned Area Emergency Response Teams on 2003 Southern California Wildfires

Authors: Jess Clark, Annette Parsons, Tom Zajkowski, Keith Lannom
Presenter: Jess Clark
USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT

During the three weeks of fire suppression and immediate post-fire rehabilitation assessment in Southern California, the USDA Forest Service Remote Sensing Applications Center (RSAC) evaluated imagery from many different sensors. RSAC provides Burned Area Emergency Response (BAER) teams with imagery and derived data products to assist soil burn severity mapping. For fires that burned in Southern California, RSAC evaluated the application of several remote sensing platforms in emergency BAER assessment. This paper outlines each sensor used, benefits and disadvantages to each, and conclusions derived from RSAC's involvement in this process.

Hyperspectral Remote Sensing of Fire-Induced Water Repellent Soils, Hayman Fire, Colorado

Authors: Sarah A. Lewis, Peter R. Robichaud, Joan Q. Wu, Bruce E. Frazier, William J. Elliot
Presenter: Sarah A. Lewis
USDA Forest Service, Rocky Mountain Research Station, Moscow, ID

Forest fires may induce changes in soil organic properties that often lead to water repellent conditions within the soil profile which decrease soil infiltration capacity. The remote detection of water repellent soils after forest fires would lead to quicker and more accurate assessment of erosion potential. An airborne hyperspectral image was acquired over the Hayman Fire in the summer of 2002. A supervised classification was performed in an attempt to identify soils that were highly water repellent and therefore high erosion risk. The classification was not highly accurate in determining water repellency severity, but it was nearly 80 percent accurate for identifying the presence of water repellency. According to the classified image, nearly 20 percent of the Hayman Fire was at high risk for erosion. These results suggest that initial burn severity maps developed by postfire rehabilitation teams may have over estimated areas of high burn severity and erosion potential.

Salon G-I — Tech Track

Field Protocol for Map Thematic Accuracy Assessment

Author-Presenter: Clinton K. Williams
USDA Forest Service, Intermountian Region, Ogden, UT

A fundamental question concerning any map is: Is it fit for use? A map is a representation of a specific geographic area so the most useful evaluation of any map comes from comparing the map to the area. The protocol field assesses thematic map accuracy and is intended for map users to determine fitness for use. It was field tested in 2003. Each theme is assessed by visiting ten polygons. Within each polygon a ten plot transect characterizes the polygon. Ten polygons per theme and ten plots per polygon gives objective quantitative results. Each transect usually takes 2-3 hours. It requires field visits to ten polygons per theme with ten plots per polygon and pre-established rule sets to define the themes in the field.

Guided Super-Resolution Image Restoration

Author-Presenter: Shawn P. Neugebauer
Booz Allen Hamilton, Salt Lake City, UT

We describe recent results on Guided Super-Resolution (GSR) image restoration, an advanced image processing capability allowing analysts to exploit targets/areas-of-interest using otherwise low-quality imagery. The quality of image analysis is generally correlated with the National Imagery Interpretability Rating Scale (NIIRS) score of the imagery, e.g., the low NIIRS scores typical of thermal collections often limit the exploitation of such imagery. GSR compensates for the lack of high spatial resolution in a variety of spectral image phenomonologies (including IR, EO, MSI, and HIS) by introducing additional information into the super-resolution process thus improving the resolved results. Increased resolution usually results in higher NIIRS ratings, which increases the ability to identify details about potential targets/areas-of-interest. The use of GSR can permit increases in the NIIRS rating of two to five points, and it helps analysts to interpret details that might otherwise be difficult/impossible to detect.

Salon E — Resource Inventory

Management Zones as a Geospatial Tool to Integrate Installation Activities

Authors: Douglas C. Comer, Christopher Hamilton, Katharine Kerr, Eileen Regan, Alicia Shepard
Presenter: Douglas C. Comer
Cultural Site Research and Management, Baltimore, MD

Fort Benning and its stakeholders are establishing cultural resource management zones utilizing geospatial technologies that incorporate existing survey data into a user-friendly tool for management, one that will provide the Army Alternate Procedures transparent compliance with Section 106 of the National Historic Preservation Act. Zones have been designated based on the type and sensitivity of resources, desired use, desired condition, and boundaries suggested by landscape features. Development of a monitoring plan, indicators, instruments, and standards will enable activities within those zones to be adaptively managed based on their alignment or conflict with metrics established for a set of heritage ethic goals and objectives. These cultural resource management zones represent one layer of a GIS that can interact with others (e.g., for natural resources or military training), providing a powerful tool for making informed decisions across the installation. It benefits the field user, installation managers, and regulatory community.

Using MODIS and ETM+ to Examine the Effect of Spatial Scale on Leaf Area Index Estimates in Forest Burn Chronosequences

Authors: Rachel Smith, Xuexia Chen, Alexis Conley, Lee Vierling
Presenter: Rachel Smith
South Dakota School of Mines and Technology, Rapid City, SD

Monitoring regional and global effects of wildfire using satellite data requires appropriate spatial and temporal detection of the extent and impact of fire disturbance. For this study, satellite data and ground-based leaf area index (LAI) measurements from a ponderosa pine dominated forest in the Black Hills, South Dakota, and a mixed boreal forest located near Krasnoyarsk, Russia were used to investigate the accuracy and potential improvements of LAI estimates from the MODIS and ETM+ sensors across a wide range of post-fire conditions. At the Landsat ETM+ scale, the reduced simple ratio (RSR) had the highest correlation with LAI for both field locations. These regression models were used to scale up ETM+ data to compare to the1km resolution MODIS LAI product. Results showed that MODIS LAI overestimated the low LAI deciduous forests and underestimated the high LAI coniferous forests.

Salon F — Post-Fire

Mapping Burn Severity in Southern California Mediterranean Type Vegetation Using Landsat and IKONOS Data

Authors: Anna R. Lieberman, Douglas Stow, John Rogan, Janet Franklin
Presenter: Anna R. Lieberman
San Diego State University Geography Department, San Diego, CA

The objective of this research was to examine the use of satellite multi-spectral imagery to map three-levels of fire severity within two southern California fire scars. Specifically, we compared the effects of spectral transforms, temporal dimensionality, classifiers, and satellite sensor types on the ability to accurately map wildfire severity when field data was used for training. Temporal differencing of the Kauth Thomas transform on Landsat Thematic Mapper (TM) imagery was the most accurate of all approaches and image type tested for both burn sites. The classification maps derived from the Normalized Burn Ratio (NBR) spectral transform on TM imagery and non-enhanced IKONOS multispectral image resulted in the lowest accuracies. Additional findings demonstrated that map accuracy of forested areas within both study sites was consistently higher than for chaparral shrublands. Such results indicate a need for the refinement of burn severity mapping techniques in Mediterranean-type ecosystems, especially those dominated by shrublands.

MODIS Applications in 2003 Fire Management

Authors: Cecily A. Ryan, Bryce L. Nordgren, James P. Menakis, Mark A. Finney, Wei Min Hao
Presenter: Cecily A. Ryan
USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, Missoula, MT

Detecting fires from satellite imagery has been under development for decades. However, incorporation of such data into wildfire management is very new. During the 2003 north-western US fire season, the Fire Sciences Laboratory's satellite receiving station retrieved and processed MODIS data from NASA's Terra and Aqua satellites in real-time, four times every day. The most crucial aspect of processing MODIS data in-house is being able to rapidly produce fire intelligence for distribution to fire managers. To this end, satellite overpasses were preferentially monitored, maximizing regional coverage, and the timing of data processing and information flow was optimized to scheduled Multi-Agency Command (MAC) briefings. We will discuss several new products, such as region-wide detection and mapping of hot-spots, identification of potential new fires, initialization of fire perimeters for FARSITE, overlaying hot spots to maps of communities, power grids, and other infrastructure at risk, and assistance in defining airborne IR flight paths.

Salon G-I — Tech Track

DataDoors - A Portal for Field or Office Access to Distributed Imagery Archives

Authors: Paul Cunningham, Russ Cowart
Presenter: Paul Cunningham
i-cubed : information integration & imaging LLC, Fort Collins, CO

The incredible diversity of geographic datasets, particularly imagery, has created unprecedented opportunity to improve geospatial decision making processes. However, the disparate nature of the datasets, complex acquisition interfaces and large file sizes has inhibited their utilization. Even local archives of imagery are often procured for a specific project and subsequently stored away never to see the light of day again. This paper will explore how field staff can easily discover what is available for their project area and rapidly acquire the imagery they need to do their jobs. It will demonstrate a system that lets the end-user specify what imagery products they want - including processing algorithms, map projections and file format - and get them delivered all in a matter of minutes.

Surfing on Wavelets

Authors: Jim Dielschneider, Karen Morley
Presenter: Karen Morley
LizardTech

Wavelet image compression can enable field unit access to massive image data stores in real time over the Internet. Imagery is often a valuable decision making tool but it needs to be accessible to those making decisions. Technology advancements can make high resolution, high quality imagery available over wireless networks to any device. See an example of how Forest Service applications can benefit and go through the steps to implementation.

Salon E — Sensor Track

Quantifying SLC-Off Landsat 7 Effects for Emergency Response Burn Mapping

Authors: Randy A. McKinley, Jeffery Eidenshink
Presenter: Randy A. McKinley
USGS EROS Data Center/SAIC, Sioux Falls, SD

The Landsat 7 ETM+ SLC-off problem produces data gaps along and across scan lines. The width of the gap varies from 1 pixel near nadir to 13 pixels off-nadir. One method that is being investigated to mitigate the SLC-off problem is interpolation of data to fill the gaps. In order to quantify the effects of the interpolation of data gaps on the normalized burn ratio (NBR) products we used a “good” Landsat-7 scene of the Rodeo-Chedeski fire in the summer of 2002. We obtained an SLC-off mask from the same path row and applied it to the “good” scene to simulate the SLC-off problem. We used various interpolation techniques to fill the SLC-off data gaps at differing stages of processing (i.e., in raw data and/or NBR data and the final classified Burned Area Reflectance Classification (BARC) map. This paper presents the comparison of SLC-off and good Landsat data.

The Changing Orbital Landscape: Platforms that Support Forestry Applications in 2004

Authors: Chris Hill, Jim Smith
Presenter: Chris Hill
Space Imaging, Frederick, MD

The purpose of this paper is to provide the USDA Forest Service with a broad overview of the current commercial satellite remote sensing industry’s capabilities in 2004. The paper evaluates the various technical capabilities of the various platforms on orbit, and discusses some of their unique advantages as they relate to Forestry applications. In particular, the paper focuses on medium and high resolution optical and RADAR platforms that support the Forest Service’s mission. The presentation will focus on medium resolution imagery from the SPOT and IRS satellites, and high resolution imagery from IKONOS, QuickBird, and OrbView-3 systems. It will provide an overview other the various optical sensors on board; their spatial, spectral, and temporal resolutions; and will evaluate their capacity and imaging capabilities. The presentation will also discuss RADARSAT-1 and how the EU’s ASTER platform is being used to create cost effective DEMs worldwide.

Salon F — Resource Inventory

Ice Velocity Mapping of Antarctic Ice Stream and Tributaries Using Interferometric Synthetic Aperture Radar (InSAR)

Authors: Elias Deeb, Rick Forster
Presenter: Elias Deeb
University of Utah, Salt Lake City, UT

Over a 30-day period in fall of 1997, dual-pass C-band interferometric synthetic aperture radar (InSAR) data for Antarctica was collected by the RADARSAT Antarctic Mapping Project (RAMP). This data set has provided scientists with an unparalleled, high-resolution 'snapshot' of the entire Antarctic continent. Particularly, this InSAR data set can be used to measure ice velocity. Research has revealed an extensive tributary system of ice streams feeding the larger ice shelves, in effect, allowing the opportunity to better understand the broad mass balance conditions of the Antarctic ice sheet. For this discussion, satellite radar interferometry (SRI) is used for a scence depicting the confluence of the RAMP ice stream and the Recovery Glacier, East Antarctica. A displacement map of ice velocity is produced, and an analysis of the study area in question is provided.

Resource Photography, Digital Cameras, Satellite Imagery, and Feature Analyst – A Forester’s Remote Sensing Toolkit

Author-Presenter: Karen Owens
USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT

Foresters and resource specialists today have a variety of remote sensing tools and data available to them. With only a set of photographs, a scanner, and a little bit of instruction, almost anybody can enter into the digital realm. Imagery like scanned photography or digital camera images can be worked with using software available to anyone in the Forest Service. GIS layers can be created and updated, forest changes can be mapped, and more. With a little more investment, software like VLS’s Feature Analyst can be used to map features like dead trees and roads. All of these data and tools are relatively easy to work with and training is easier than ever to access, with new online courses and virtual campus classes. The small investment in time it takes to learn these new tools will pay off big in getting the job done.

Salon E — Sensor Track

Multi-spectral Digital Imaging System

Author-Presenter: Jon Kish
Titan Geospatial Services, Portland, OR

Titan's next generation Multi-spectral Digital Imaging system is currently being developed to provide a cost effective system for use in collecting aerial reconnaissance data. The system is composed of two Wide Field of View (WFOV) and one Narrow Field of View (NFOV) Illunis digital cameras. When combined, the (WFOV) cameras generate an image consisting of 3600 pixels in width and 2000 pixels in height (7.2 MegaPixel) . A 4000 x 2700 pixel (11 MegaPixel) image is produced from the (NFOV) camera. A Color-Infrared (CIR) composite image is produced from the WFOV cameras. Conversely, a natural color (Red, Green, and Blue) RGB image is produced from the NFOV camera. Compared to the current MDIS system imaged at comparable ground sampling distances (GSD), the larger footprint size provided by the next generation system would allow areas of interest to be acquired in fewer flight lines.

Salon F — Resource Inventory

Mapping and Characterizing Urban Forest with a Combination of LiDAR Data and Color Digital Orthophotos

Authors: Eli Rodemaker, Dr. John Colwell, Norm Roller
Presenter: Norm Roller
Marshall and Associates, Inc., Olympia, WA

Urban planners and foresters are increasingly interested in the amount, location and condition of trees in the city. Marshall has developed a procedure that uses digital color orthophotos and LiDAR data to map and evaluate the urban forest resource more accurately than is possible with either source of data, alone. The LiDAR data is used to identify objects that may be trees, based on a height threshold. Automated procedures are then applied to the photographic data to edit out objects that are not part of the tree canopy. Additional information can then be extracted about the canopy, including height of individual trees, crown cover per unit area, and location of "holes" in the canopy, as well as estimates of bulk canopy volume. An example of such information produced for the city of Seattle is described.

Salon E — Resource Inventory

Combining New and Old Technologies in Geologic Map Production in Utah

Authors: Grant C. Willis, Kent D. Brown
Presenter: Grant C. Willis
Utah Geological Survey, Salt Lake City, UT

The primary geologic mapping goals of the Utah Geological Survey are state-wide map coverage at 1:100,000 and 1:24,000 scales. To meet these goals, we have experimented with a variety of field and laboratory map production methods, including analytical and digital photogrammetry, ruggedized field pcs, heads-up digitizing and auto-vectorizing, and production softwares. A mix of old and new methods produces the best data in the least amount of time. For example, mapping on aerial photographs, similar to methods employed 40 years ago, is still the most efficient procedure for capturing field data. However, high-resolution digital orthophoto quadrangles and raster base maps are used for geo-referencing field data. Superimposed orthophotoquad and topographic base maps provide an excellent medium for manual compilation of field mapping. They can later be scanned and then filtered to remove extraneous information, leaving only easily vectorized geologic data.

Off-highway Vehicle Mapping on Bridger-Teton and Dixie National Forests: An Investigation of New Mapping Methods Using Remote Sensing

Authors: Chuck Werstak, Vicky Johnson
Presenter: Chuck Werstak
USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT

Off-highway vehicle use has become a priority issue across the Forest Service. Typically, National Forests do not have accurate inventories of their system and non-system trails. With many miles of new trails being created each year this proliferation of trails is becoming a major problem for travel planning, recreation, soil erosion, watershed contamination and wildlife disturbance. In an effort to help the Forest Service address these issues, the Remote Sensing Application Center has been working with the forests to investigate semi-automated and manual mapping methods and tools that may be used to help address these issues. Recent pan-sharpened IKONOS imagery (1-meter) and current airborne digital multispectral imagery (.25 to 1 foot) was collected over both study areas. In addition, several years of archived aerial photography was also obtained for perspective. Semi-automated approaches, manual digitization, and dot-grid assessments are being examined for their potential use.

Salon F — Resource Inventory

Vegetation Dynamics and Erosion Modeling Using Remotely Sensed Data (MODIS) and GIS

Authors: Willem van Leeuwen, Geoff Sammons
Presenter: Willem van Leeuwen
University of Arizona, Tucson, AZ

Drought, wildfire and monsoon rainfall events can have a devastating impact on the sustainable use of arid and semi-arid land resources. The main objectives of this research were to use MODIS products and data integration methods to assess land degradation and rehabilitation and to incorporate seasonal and geospatial vegetation and climate products into two soil loss assessment models. A geospatial land degradation information system is used to develop seasonal assessment maps of land degradation potential for arid and semi-arid landscapes. The system incorporates slope and aspect data and soil data in combination with geospatial and temporal precipitation and remotely sensed vegetation cover data. The regional soil loss potential maps provide improved delineation of the regions that are at greatest risk of soil loss and soil deposition. Both scientists and decision makers can use this tool to assess the ability of landscapes to support varying forms of land use.

Monitoring Rangeland Trend with Remote Sensing

Author-Presenter: John Gillham
USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT

This project explored geospatial technologies for assisting with the management and monitoring of USFS rangelands. Twenty sites on the Apache-Sitgreaves National Forest were sampled for forage productivity throughout the 2002 and 2003 growing seasons and analyzed in conjunction with relevant Landsat imagery. As well, MODIS data was collected to assist with time-series analysis. Correlations made between ground measurements and Landsat data helped to better relate MODIS to the ground, using Landsat to MODIS correlations. Temporal analysis using MODIS data will assist managers to assess range readiness, monitor utilization levels, and extend or shorten the length of the grazing season more accurately and dynamically. A web-based monitoring system was developed to simplify the processing and visualization of satellite data. This dynamic website makes viewing imagery products(such as time-series animations) easier and more accessible to field personnel, making an operational rangeland monitoring system using remote sensing technologies more feasible.

USGS IFSAR Applications for the National Petroleum Reserve - Alaska

Authors: Lori Baer, John Kosovich
USGS, Denver, CO

Title: USGS IFSAR Applications for the National Petroleum Reserve - Alaska The National Petroleum Reserve – Alaska (NPR-A) consists of a 23 million-acre region on the North Slope that was established in 1923 because of the region's petroleum potential. BLM responsibilities include analysis of ecological impacts in relation to proposed ice road and oil well placement. Key to this analysis is high-resolution digital elevation data. In 2003, through the USGS Land Remote Sensing Program, the BLM acquired Interferometric Synthetic Aperture Radar (IFSAR) as part of an ongoing collection cycle over the NPR-A area. USGS researchers at the Rocky Mountain Mapping Center in Denver, Colorado have been working closely with BLM-Alaska scientists and resource managers to provide experimental IFSAR-based products for use in several analytical studies.

Estimating Impervious Surfaces in the Upper San Diego River Watershed, San Diego County, California

Authors: Jason Batchelor, Ross Martin
County of San Diego, Department of Planning and Land Use, San Diego, CA

An estimate of the amount of impervious surface was conducted in the Upper San Diego River Watershed in San Diego County, California. Techniques available in Visual Learning System's Feature Analyst software were employed to extract impervious features from IKONOS 4-meter multispectral satellite imagery. Statistical testing of the results against ground truthing data show an overall accuracy of 96.7% and a Kappa of 0.933. The results indicate that Feature Analyst is an extremely powerful and efficient tool capable of accurately identifying pervious and impervious land cover features. However, misclassification of areas under tree cover and in shadow is evident thereby effectively reducing the total impervious surface area predicted.

Wyoming's Forests: Predictive Mapping Using FIA Data, MODIS Imagery, and Other Spatial Information

Authors: Jock A. Blackard, Gretchen G. Moisen, Ronald P. Tymcio
USDA Forest Service, RMRS, FIA, Ogden, UT

Several forest attributes were recently mapped for the state of Wyoming using FIA data and MODIS imagery. A hierarchical modeling process was employed to obtain the predicted values of these forest attributes. Accuracy assessments derived from modeling investigations were performed on independent test sets. This poster display was created to present mapped modeling results for several forest attributes across the state of Wyoming.

Multi-source and Multi-classifier System for Regional Landcover Mapping

Authors: Kenneth Brewer, James A. Barber, Gregor Willhauck, Ursula C. Benz
USDA Forest Service, Northern Region, Missoula, MT

Forest managers need consistent and continuous data on existing vegetation and landcover to address most land management issues and concerns. The current operational approach used by the USDA Forest Service, Northern Region to produce such data using a multi-source and multi-classifier system is described. Methodological components of this system include: a) ecogeographic stratification, b) production of image objects through image segmentation, c) incorporation of multi-temporal image data and change detection, d) extensive use of ecological modeling and and other ancilliary data, e)generation of reference data integrating field sampled inventory data through a structured aerial photo interpretation process, and f)utilization of multiple classifiers for different levels of the classification hierarchy. Note: This is a poster presentation of a manuscript to be published in an IEEE/NASA proceedings. The purpose for presenting the poster here is to update the Forest Service remote sensing community on the progress of this project.

Landsat 7 Gap Filled Product

Author: Gyanesh Chander
Science Applications International Corportation (SAIC), Sioux Falls, SD

The Landsat 7 satellite suffered the failure of its scan line corrector the end of May 2003. This failure causes the loss of approximately 25% of the imagery due to undersampled scans. A technique to correct this problem has been chosen, and Scan Gap-Filled products will be available to customers in June 2004. The gap pixels are filled with data from a previously acquired scene that is registered and histogram matched to the SLC-Off image. The histogram matching technique is a localized linear transform performed in a moving window throughout the missing pixels. The histogram match methodology is illustrated, an example of corrected data is presented, and absolute mean difference errors are estimated.

Applications of 5-m IRS Satellite Imagery

Author: Ken Dutchak
Alberta Forest Protection Division, Wildfire Information Section, Edmonton, Alberta, Canada

The Department of Sustainable Resource Development found that after the fires of 1998 that its knowledge of access features in the forest (roads, trails and seismic lines) was significantly lacking. To solve the problem, they reseached the most effective way to update and maintain the new dataset as effectively as was possible. A project was established and initiated using 5.0m IRS Satellite imagery. In a period of 3 years, some 650 1:50k NTS tiles of information were created for the province. This data is now maintained using IRS and other orthorectified imagery. Applications of the imagery include the basic use of having an image as a backdrop for spatial information such as fire progression maps to hand held PDA use, the imagery has mushroomed in its use. The imagery is a cost effective product and with the added utilization, is excellent value to the department.

Light Spectra and Airborne Remote Sensing of Eurasian Milfoil

Authors: James Everitt, M. A. Alaniz. Alfredo Gomez, M. R. Davis
USDA-ARS, Weslaco, TX

Eurasian watermilfoil (Myriophyllum spicatum L.) is an invasive, exotic, submersed aquatic weed that invades and clogs waterways throughout the United States. A study was conducted to evaluate the potential of using remote sensing techniques to distinguish infestations of this aquatic weed in Texas waterways. Field reflectance measurements showed that Eurasian watermilfoil could be spectrally distinguished from other associated species in either the visible or near-infrared regions of the electromagnetic spectrum. Eurasian watermilfoil submerged at depths greater than 5 cm below the water surface had similar visible reflectance to water. Surfaced Eurasian watermilfoil could be distinguished on color-infrared (CIR) aerial photography where it had a grayish-pink or faint pink image response.

A Stream-lined Approach for Assessing Wildfire in Riparian Areas

Authors: Haans Fisk, Lynn M. Decker, Kevin Megown
USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT

This poster demonstrates how standard geospatial datasets, modeling, and statistical analysis were used to assess wildfire inside and outside riparian areas. Digital Elevation Models (DEM) and Burned Area Reflectance Classification (BARC) data layers helped produce a dataset that was used to assess factors affecting burn values at multiple scales: 1) all fires, 2) individual fires, and 3) individual watersheds. Data processing was streamlined through the use of customized ArcInfo AML programs and SAS analyses. Project results indicated that: 1) riparian areas burn less hot than upslope environments; 2) while riparian areas burn less hot, riparian burn values relate positively to upslope burn values; and 3) lower-order stream environments burn more like upslope areas, and as stream order increases, riparian area fires become less hot. The implementation of this approach will allow resource specialists to establish baseline data for future fuels planning, environmental analysis, and consultation under the Endangered Species Act.

Removing Holes and Slivers from Mosaicked 10-Meter Digital Elevation Models

Author: Renee Jacokes
USDA Forest Service, Southern Region, Altanta, GA

Generating a continuous mosaiced Digital Elevation Model (DEMs) file is not a quick process or simple procedure. The primary problem, inherent to a mosaiced DEM file, is the null values that create gaps or holds and silvers that often occur between the edges of DEMs. This problem is further complicated by the presents of null values around the outside boundary of the mosaiced DEM file. The Southern Region's Geospatial Unit has address this problem by developing a model that removes the gaps from 10-meter DEMs after mosaicing. This paper discusses the process and model used to remove holes and slivers from a mosaiced DEM file.

Ground Penetrating Radar and Seismic Refraction as Tools for Characterizing Aquifer Properties in Recently Active Glacial Moraine Settings, Tongass National Forest, Alaska

Authors**:** Everett Hinkley, Noel S. Philip, Steve D. Sheriff, Robert Gubernick
USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT

Ground penetrating radar (GPR) and seismic refraction surveys were conducted at a critical location on a glacial moraine near Yakutat, Alaska. Observations of the aquifer material on the moraine were made from exposures at the surface and from shallow excavation. The near-subsurface moraine material is composed of clean sand and poorly sorted gravel, along with boulders with a major axis of +1m. Seismic data acquired at the moraine show a subsurface depth to refractor of ~10-16 meters at the moraine. GPR data show a strong reflection at ~25-30m depth. The expected results from the surveys should allow a reasonable geometric model of the subsurface to be made within a 10% estimated resolution of depth. Further applications of the data set and extrapolated properties of the subsurface should lead to a reasonable conceptual model of hydrogeologic units and general flow regime.

Detecting Yellow-cedar Decline at Multiple Spatial Scales in Southeast Alaska

Authors: Everett Hinkley, Paul Hennon, Dustin Wittwer, Dave D'Amore, Tom Heutte
USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT

Yellow-cedar is an important tree species found dead or dying on 200,000 ha in Alaska. We are developing methods to detect and classify mortality at three spatial scales: regional (7x106 km2), mid-scale (800 km2), and small watershed (1km2). Aerial sketch mapping and forest inventory plots are used at the regional scale to develop overall distributions of healthy and dying cedar forests. Color and false-infrared photography is used to associate mortality with elevation and proximity to bogs at the mid-scale. At the small watershed scale, IKONOS, SPOT, various scales of color and false-infrared photography, LiDAR, image analysis, and ground vegetation plots are used to classify concentrations of dead trees and associate decline with landscape position and micro-topography. Information from each scale provides clues about the cause of this mysterious forest problem and is useful as we help develop a management strategy for the species.

Remotely Sensed Pine Stands in the Pine Basket of Virginia

Authors: Robert L Kurtz, Dr. John Scrivani
Virginia Department of Forestry, Charlottesville, VA

Landsat TM imagery was classified and used to identify areas of Virginia's piedmont and coastal plain, known as the "Pine Basket," that present a high suseptibility to Bark Beetle infestation. The imagery was classified on a pixel by pixel basis to the land cover types of pine, hardwood, mixed forest, water, agriculture, marsh, and urban. Pixels classified as pine were then aggregated using four orthogonal neighbors and sieved at one acre. The resulting pixel clusters were output as a dataset suitable for incorporation into a GIS. The area of pine was then calculated as a percentage of total land area in the Pine Basket and compared to FIA estimates of pine in the same area.

Evaluating High Resolution Hyperspectral Images for Determining Post-fire Burn Severity

Authors: Denise Laes, Paul Maus, Pete Robichaud, Sarah Lewis, Andy Hudak, Ray Kokaly
USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT

The Joint Fire Science Program supported this cooperative project in which high spatial resolution hyperspectral data were analyzed in conjunction with field spectrometer data and traditional post fire field survey data. The objective of the project was to evaluate whether hyperspectral data could provide additional information to BEAR teams about post-burn severity and potential impacts to watersheds. The study area for this project was the Colorado Hayman fire of 2002 which consumed nearly 140,000 acres. Fourteen flight lines of hyperspectral data were acquired and analyzed. The results of this project show how a partial unmixing process applied to the hyperspectral data made it possible to characterize materials on the ground into ash, bare soil/rock, scorched vegetation and unburned vegetation. By developing a more precise post-fire map, rehabilitation efforts can be more efficiently prescribed and applied.

Tamarisk Pilot Mapping Inventory Study

Authors: Denise Laes, Paul Maus, Tom McClure
USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT

A collaborative project between the Remote Sensing Application Center and the Tamarisk Coalition evaluated different sources of digital imagery for mapping the invasive species tamarisk. Digital images with differing spatial and spectral resolution were acquired at two study sites near Grand Junction, CO. Analysis utilized NC and CIR data collected with Kodak digital cameras as well as hyperspectral data collected with the HyMap sensor. The digital camera images were classified using Feature Analyst. The hyperspectral data were classified using a partial unmixing method. The results indicate that the higher spatial and spectral resolution data collected during the summer can be used to differentiate larger stands of tamarisk from other riparian vegetation. An accuracy assessment resulted in overall accuracies of 76% and 89% for dense mature tamarisk stands on the two study site. Younger and smaller tamarisk shrubs, important for detecting early infestations, were more difficult to map accurately.

Kentucky Landscape Snapshot - A NASA Funded Project for the Commomwealth

Authors: Bill Luhn, Roy Boggs,
USDA Forest Service, Region 8, Daniel Boone National Forest, Winchester, KY

The Kentucky Governor's Office for Technology was awarded a $1.3 million grant from the National Aeronautics and Space Administration (NASA) in December 2001, to fund the Kentucky Landscape Snapshot (KLS) Project. Deliverables from the KLS project are: • Updated Anderson Level II statewide landcover map • Forest-cover map Anderson Level III (with R&D to level IV) • Stratified forest inventory • Attempt to push a forest classification scheme to a level IV scheme using ancillary data, local forest and ecological knowledge • High-resolution landcover map for 2 counties/8 urban areas within the counties • A set of very useful tools for decision makers and land planners This poster will explain the project and show examples of the data products and software applications to be released.

Operational Accuracy of LiDAR in Mountainous Terrain

Authors: Jim McKean, Josh Roering
USDA Forest Service, Rocky Mountain Research Station, Boise, ID

Conventional LiDAR accuracy assessments are done by surveying flat surfaces at airports. Normally this characterizes only the vertical errors generated by the LiDAR hardware/ software system. Little information is available about LiDAR operational accuracy in mountainous terrain where the system errors combine with uncertainty related to topographic roughness to produce the total 3D survey error. We have evaluated the operational LiDAR accuracy at a landslide complex with a variety of topographic roughness. Over smooth terrain near the landslide, point elevation absolute errors were <15 cm, but there were local vertical discrepancies of up to 45 cm. Within the rougher landslide, the range of errors increased to ± several meters. Relative elevation errors were less than 60 cm over smooth terrain, increased to 1 m over an active earthflow, and 3 m in a rocky portion of the slide. We were not able to distinguish LiDAR elevation errors from planimetric errors.

FIA Aerial Photo Plots for the Pinyon-Juniper Forest Type

Authors: Kevin Megown, Gretchen Moisen, Mark Finco
USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT

Capturing data from large-scale aerial photography offers a cost-effective method of understanding the Piñyon-Juniper condition. This method also allows for a detailed picture of each sample location, which is useful-for present day field use and future analysis. Significant cost-benefits can be realized by weighing the costs of ground plot data collection with aerial photo methods, while maintaining good estimates in the measured variables and inferred variables. The method used, known as a double sample, requires same-tree-measurement on ground and photo plots, allowing for growth relationships to be understood from previous plot data records. To determine the sample size required for understanding these relationships, attention is focused on the effect of sample size and variability in the underlying sampled populations. The double sample method works well in the Piñyon-Juniper condition, as it does not change in drastically over the determined periodic measuring-event of ten years.

Simulating the Landscape: LANDSUM v4 and its use in the LANDFIRE Project

Authors: Maureen Mislivets, Robert E. Keane, Lisa Holsinger, Sarah Pratt
USDA Forest Service, RMRS, Fire Sciences Lab, Missoula, MT

The LANDscape SUccession Model version 4.0, LANDSUM v4, was developed to support the mapping of historical landscapes for the LANDFIRE project. The LANDFIRE project is dedicated to mapping vegetation, fuels, and fire regime condition classes at 30-meter resolution across the entire contiguous United States. A fire regime condition class reflects the degree of departure of current landscape conditions to historical landscape conditions. A simulation approach was taken to create this historical landscape. LANDSUM results will then be used to direct ecosystem restoration projects and fuel reduction treatments. We present the LANDSUM v4 model and initial results for a large landscape in Utah, known as zone 16. This poster explains the process of preparing data for the model, executing the model, extracting results, and analyzing the output. This model will be used across all LANDFIRE zones to consistently produce historical landscapes and develop fire regime condition classes across the US.

System for Automated Feature Extraction and Image Sharpening

Authors: Shawn Neugebauer, Tim Patterson, Scott Fairchild, Brian Gunderson
Booz Allen Hamilton, Salt Lake City, UT

We describe and demonstrate two image processing algorithms: Lines of Communication Automated Extraction System (LOCATE) and SHARP (Sharpening Hyperspectral). LOCATE automatically detects, extracts, and vectorizes GIS road (and other) networks from satellite or airborne multi/ hyper-spectral imagery, and it permits classification of road surface and calculation of road width. LOCATE uses a series of algorithms to enhance the road networks before using an artificial intelligence algorithm to detect them. These capabilities allow the building of vector-based maps with spatial and spectral attributes. LOCATE employs the SHARP image fusion algorithm, which fuses high-resolution panchromatic imagery with lower resolution multi-spectral and hyper-spectral imagery. SHARP enables imagery analysts to exploit low-spatial-resolution multi/hyper-spectral imagery at higher spatial resolutions than previously allowed. LOCATE and SHARP are built as extensions to the commercial image-processing tool ERDAS Imagine.

Mapping of Active Fire Area by Image Gradient Techniques

Authors: Ambrose E. Ononye, Anthony Vodacek, Ying Li, Zhen Wang
Rochester Institute of Technology, Rochester, NY

A variety of hyperspectral and multi-spectral sensors have been proposed for use as tools to help in the management of wildland fires. Maps of the fire area generated from aerial imagery will enable fire fighters to respond more appropriately to fire. Exploitation of the rapid intensity, radiance or temperature change in an image may be utilized to generate such map. In this paper, we present a mapping technique based solely on 2D image processing edge detection tools. A smoothing filter was used to reduce sensitivity to noise. The pre-processed data were then processed with the edge detection routines to highlight regions of rapid intensity, radiance or temperature changes. A threshold automatically generated from image histogram was used to identify active fire regions. Maps were then generated using high frequency mask. Results with AVIRIS fire imagery (1995 Cuiaba, Brazil and 1999 San Bernardino Mountain, USA) and Wildfire Airborne Sensor Program (WASP) and Modular Imaging Spectrometer Instrument (MISI) data sets over controlled targets are presented.

Quantifying Historical Change in Juniper Woodland Communities with Aerial Photography and GIS

Authors: Dianne Osborne, James Ward, Melanie Miller, Jolie Pollet
Bureau of Land Management, Denver, CO

Juniper woodland communities have expanded throughout the west into areas not occupied historically. The encroachment of juniper into previously unoccupied areas has implications for vegetation, wildlife habitat, and wildland fire managers. BLM needs to enhance their understanding of changes in juniper woodland communities and is working on a prototypical application in southwestern Utah using aerial photography to quantify associated change. Historical aerial photography (1939) and current aerial photography (1999) were interpreted and compared to identify categories of juniper woodland distribution and canopy cover density. GIS ready maps were generated from the interpreted photography. Change in juniper canopy and/or extent over time was quantified using analysis tools in GIS. These remote sensing and GIS tools support BLM efforts to determine how juniper woodland communities have changed over time, and provide managers with additional quantifiable information from which to base management decisions.

Maryland's Use Of Remote Sensing For Fire & Stewardship Impact Modeling

Author: Pat Patterson
Maryland DNR Forest Service, Annapolis, MD

Marylands posters will examine two primary topics. This discussion covers the modeling methodology used for evaluating Wildfire issues in Maryland and methodologies used to evaluate remotely sensed data so that field fire managers can more easily use it at a glance. The arguments cover evaluating the WUI Fire Models at 30m pixel, 2.5Km Hex grid, 12 digit watershed and county levels. We will also have posters which suggest how the Wildland Urban Interface can be identified as the intermix of housing and forest using the 2.5Km hex grid methodology. Our second set of posters which compliment the first is the 2.5Km Hex Grid Stewardship Impact Initiative Model which Maryland and three other pilot states have been working on for the past two years. We also illustrate a full set of finished product maps for the project, the 30m pixel results and other pertinent maps associated with the Maryland project.

Wildfire Mapping and Monitoring For The United States with MODIS

Author: Brad Quayle
USDA Forest Service, Remote Sensing Applications Center, Salt Lake City, UT

Since 2001, The USDA Forest Service Remote Sensing Applications Center (RSAC) and its collaborators at NASA Goddard Space Flight Center (GSFC) and the University of Maryland have provided timely and comprehensive MODIS active fire mapping products to national and regional fire managers to facilitate strategic decision-making as well as to the public for general fire information. Since its inception, the Forest Service MODIS Active Fire Mapping program has evolved to provide a suite of MODIS geospatial fire products for the continental United States and Alaska that are updated several times daily and available unrestricted via the Internet. These MODIS geospatial fire products include regional and national fire detection maps, interactive web maps, georeferenced image subsets, fire detection GIS data and additional related fire information.

Historic Time-Series Land Cover/Use Analysis Using Resource Satellite Imagery

Author: James Rack
Resource Assessment Unit, Grand Rapids, MN

Resource satellite imagery has been around long enough that it has become a useful tool in historical time-series research on land use, forest management and spatial metrics. This poster shows how Landsat image analysis is being used in Minnesota to detect forest disturbances, classify changes, and date regenerating stands over the period 1983-2003.

Using Aerial Photography to Create Historical Vegetation Cover Type Maps

Authors: John Saddler, Ace Haddock
Florida Division of Forestry, Tallahassee, FL

Historical aerial photograpy (1953,1967,1975,1994) was used to develop vegetation cover types for wetland restoraion in Tate's Hell State Forest, Franklin County Fl. Field data collection and GIS were used to facilitae ground truthing of the photos. This informaiton is being used to enhance forest wetland reosurce management. Poster will highlight process used to create historical vegetation cover types.

Development of Remote Sensing Monitoring Methods for the Hancock Forest Conservation Easement: A Forest Legacy Project

Authors: Steven A. Sader, Frank Reed, Kent Williams, Jacob Metzler
University of Maine, Orono, ME

The Hancock Forest Conservation Easement is one of the largest in the Forest Legacy program. In the fall of 2003, the New England Forestry Foundation and University of Maine, under a grant from Forest Legacy, initiated a project to demonstrate how remote sensing and geospatial technologies can be applied to monitor large working forest conservation easements (WFCE). Some examples from the Pingree easement in Maine (largest WFCE in the U.S.) will also be presented. The poster describes the data types, methodology and development of the monitoring protocol (what and how the specific attributes will be monitored using geospatial tools) designed for large WFCE. The major objectives are to develop cost-effective and scientifically defensible methods. The methods and approach are adaptable to other large Forest Legacy easements. Limitations and challenges of monitoring WFCE are discussed.

Use of GPS and GIS in Geospatial Analyses of Asian Longhorned Beetle Infestations in the United States

Authors: Alan Sawyer
USDA-APHIS-PPQ, Otis ANGB, MD

The Asian longhorned beetle (ALB), Anoplophora glabripennis, (Coleoptera: Cerambycidae) is an introduced pest of several important species of hardwood trees. Major control programs are underway to eradicate infestations in urban and suburban areas of Illinois, New York, New Jersey and Ontario. An understanding of the spatial dynamics of ALB infestations is crucial to designing and executing effective survey, treatment and regulatory operations. To meet that need, we have been conducting geospatial analyses of field data collected during surveys and from research sites. GPS and GIS are major tools used in these analyses of spatial distribution, dispersal, host utilization and population dynamics. Significant findings have directly benefited the management programs.

Lauritsen Historical Cabin Site

Authors: Randy Schrank, Rosemary Barnes
USDA Forest Service, Region 10, Chugach National Forest, Anchorage, AK

The Lauritsen cabin, built in 1898 along Canyon Creek on the Kenai Peninsula, Alaska, is located within the Perseverance Federal Mining Claim and surrounded by lands administered by the State of Alaska. In 2002, efforts were undertaken to refurbish the cabin and identify cultural materials, artifacts, mining claim corners and topography around the cabin. Chugach National Forest engineering staff performed an archaeological site survey. A total station was used to collect feature and topographic data in order to generate accurate contours for the final plat. Project control stations were observed with Trimble 4000SSi GPS receivers as part of a local GPS network. These stations were post-processed, adjusted and fully constrained vertically and horizontally to NGS CORS stations. GPS methods were also used to collect linear and positional data of cultural features using Trimble Pathfinder Pro receivers. The color plat includes historical and current photographs including a small format aerial photo.

Southern Wildlfire Risk Assessment Project

Authors: Tom Spencer, Julie Coen, David Buckley, James Smith
Space Imaging, College Station, TX

Texas Forest Service, College Station, TX, USA Space Imaging LLC is under contract to the Southern Group of State Foresters to develop a consistent landscape scale wildfire risk assessment and risk assessment process across the 13 southern states, Virginia, Kentucky, North Carolina, Tennessee, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas, Arkansas and Oklahoma. The poster will illustrate progress to date on the project, including GIS data layers on fire history, suppression resources, etc., and regional fuels derived from remotely sensed data. Methods for developing the baseline risk assessment from the data, and risk results from previous similar projects will be presented.

DOQs Draped Over DEMs

Authors, John Taylor, Doug Johnson
USDA Forest Service, Geospatial Service and Technology Center, Salt Lake City, UT

GSTC uses photogrammetric software called Socet Set to produce Digital Orthophoto Quads (DOQ). Socet Set is capable of draping a DOQ over a Digital Elevation Model (DEM) which can be veiwed at any elevation and from any direction. We can then print this product out into a graphic that gives a perspective similar to what one would see from an elevated platform. Our poster will demonstrate this product, and briefly explain how it was made.

NASA Water Resources for Natural Resources Applications

Authors: David Toll, P. Houser, K. Arsenault, J. Entin, A. Pinheiro, J. Triggs
NASA/Goddard Space Flight Center, Greenbelt, MD

NASA/Goddard Space Flight Center is supporting applications through partnering with other organizations to use NASA data, including from satellite instruments and Earth system models. The focus has been 1) estimating water storage including snowpack and soil moisture, 2) modeling and predicting water fluxes such as evapotranspiration (ET), precipitation and river runoff, 3) remote sensing of water quality, including both point source (e.g., turbidity and productivity) and non-point source (e.g., land cover conversion), and 4) land use/cover mapping. We are using several Decision Support Systems tools. This includes the support tools "BASINS" used by EPA, "RiverWare" and "AWARDS ET ToolBox" by USBR and "SWAT" by USDA and EPA. Regional application sites using NASA data across the U.S. are currently being evaluated and validated. The NASA data emphasized are water and energy balance data from the Land Data Assimilation Systems (LDAS) and MODIS satellite data products.

Estimating Forest Canopy Height Using TOPSAR in the Sierra Nevada of California

Authors: Wayne S. Walker, L.E. Pierce, M.C. Dobson, C.T. Hunsaker
University of Michigan - EECS Department, Ann Arbor, MI

Our research focuses on providing the USDA Forest Service with spatially explicit and accurate estimates of forest canopy height for the high-diversity montane forests of California's Sierra Nevada. We will present results of our efforts to estimate and map canopy height using airborne imagery acquired April 5th 2002 by the NASA/JPL Topographic Synthetic Aperture Radar (TOPSAR). Over 250 30-m diameter sample plots were established within a 20,000 ha pilot study area on the Sierra National Forest using a stratified-random sampling scheme; height measurements were recorded for approximately 8,000 individual trees. A combination of regression and model-based techniques are used with field data to calibrate and validate height estimates derived from a combination of L- and C-band TOPSAR DEMs, L- and C-band backscatter data, and ancillary information. All analyses and accuracy assessments are conducted using independent training and testing data sets drawn randomly from the ground-data pool.

50 States Forestry Organizations GIT Survey

Authors: Lisa Warnecke, Zorica Nedovic-Budic, Carol Franco
GeoManagement Associates, Syracuse, NY

The growth in geographic or geospatial information technology (GIT) –remote sensing, GIS, and GPS - interest and activities among the 50 State Forestry Organizations (SFOs) is increasingly recognized. The "50 States Forestry Organizations GIT Survey" is the final component of a research effort by the State University of New York - College of Environmental Science and Forestry (SUNY-ESF) and GeoManagement Associates, Inc (GMA) to better understand GIT conditions. This research complements past work (http://www.esf.edu/forest/policyIndex.html), and is similarly conducted with the National Association of State Foresters (NASF). This project is funded by the National Aeronautics and Space Administration (NASA). The survey was sent to all 50 State Foresters, lead GIT contacts, program directors, and other key persons. Data collection was from July 2003 until February 2004. Results will be analyzed by region, type of respondent and nationwide. It will reveal GIT maturity, applications, benefits, resources needed, GIT issues, and organizational and coordinating mechanisms.

Ft. Stewart Historic Photo Vegetation Change Analysis

Author: Robert M. Weber
Pinnacle Mapping Technologies, Flagstaff, AZ

Historic, archived aerial photos acquired in 1947, 1966 and 1998 were orthorectified using contemporary softcopy photogrammetry techniques. These geocorrected images were subsequently used to map vegetation communities at Ft Stewart, Georgia. Time series, change detection analysis showed a gain in area dominated by forest communities, a decrease in grassland communities and an increase in woodland vegetation types.

Application of Hyperspectral Imaging to Survey for Emerald Ash Borer in Michigan

Authors: David W. Williams, D. Bartels, V. Mastro
USDA, APHIS, PPQ, Otis ANGB, MD

The emerald ash borer (EAB), an invasive beetle from East Asia, was first discovered in the Detroit metropolitan area in the summer of 2002 and has been found subsequently throughout southern Michigan. As a killer of ash trees, the borer is already having severe impacts on urban and natural forests. Because conventional ground survey is laborious and time-consuming and the early stages of infestation are difficult to detect, survey for new infestations using remote sensing technology—in particular, hyperspectral imaging (HSI)—holds great promise. We are exploring the twofold application of HSI to mapping distributions of ash trees and locations of EAB-infested hosts in various stages of decline over wide areas. Our work to date consists of four components: image acquisition, collection of spectral signatures for ash trees and other tree species, collection of ground truth information on ash and other species, and image analysis and classification of land cover.

Accuracy of a GPS Unit Through Wet and Dry Canopy

Authors: Kate Wood, Jason Cole
SUNY Environmental Science & Forestry, Syracuse, NY

Field experience has shown GPS instruments take longer to lock onto satellites in wet conditions. We hypothesize that this difficulty in obtaining lock under wet canopy will result in less accurate positions than those achieved through dry canopy. To test this theory, a survey-grade GPS receiver was erected on randomly selected plots of known location under varying canopy composition. Each plot was recorded four times in dry conditions and four times in wet conditions. The plot's positions were recorded for thirty minutes at a constant antenna height of three meters. It appears as though the moisture content of the canopy has little to do with the instrument's accuracy. Accuracy values varied little from day-to-day. Generally, accuracy remained close to reference values.