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Office of Science and Technology Policy**

**PUBLIC WORKSHOP
ON
FUTURE LAND IMAGING FOR THE UNITED STATES**

**July 26, 2006
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Main Auditorium
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Washington, D.C.**

MEETING SUMMARY

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Executive Summary

A public workshop on the future of moderate resolution land imaging for the United States was held on the afternoon of July 26, 2006, in the main auditorium of the Department of the Interior headquarters in Washington, D.C. The workshop included two panel discussions—one of representatives from the Landsat user community, the other of representatives from the aerospace industry—and a comment session open to all who attended.

The Future of Land Imaging Interagency Working Group (FLI-IWG) sponsored the workshop as part of its fact-finding and needs assessment work in preparing a long-term plan for future moderate resolution, satellite-based land imaging capability after the Landsat Data Continuity Mission (LDCM), which is now in procurement. A December 2005 memorandum from the Director of the Office of Science and Technology Policy called for a study to identify future needs and options for U.S. land imaging and named the FLI-IWG, which reports to the National Science and Technology Council, to conduct the study. The workshop opened with a report on the Working Group's preliminary findings and its plans for preparing the long-term plan by February 2007.

The panel presenting views from the user community on Landsat data included two members representing private-sector end users of information derived from Landsat data, two commercial value-added resellers, two users from the nonprofit sector, and one representative of State and local public-sector entities. Kass Green, Vice President of the American Society for Photogrammetry and Remote Sensing (ASPRS) moderated the panel and presented preliminary findings from an ASPRS survey of users' views on future land imaging capabilities. The private sector end users described their reliance on Landsat data for legal expert witness testimony in Federal and State courts and for risk management in the insurance, finance, and health industries. Wildlife conservation and resource management is the focus of one of the nonprofit users; the second relies on Landsat data to determine the extent and consequences of deforestation in the Andes-Amazon basin. One of the value-added resellers primarily serves the Federal defense/intelligence and civil agency markets; the other uses Landsat data for commercial land cover mapping and analysis required by State and local entities and by commercial companies. Among State agencies with responsibilities for resource use or management, Landsat data consistently rank in their top five data needs. Preliminary ASPRS results show that 69 percent of the responders use Landsat data as their primary source of moderate resolution data.

The representatives of the U.S. aerospace industry on the second panel described their corporate capabilities in Earth-observing spacecraft and sensing instruments and their views on trends in future instrument capability and applications development for land imagery. The trades necessary between increasing capability and cost were discussed, as were issues in program continuity, program governance and management, lessons learned from the Landsat experience, and the current global environment for satellite-based sensing and imaging beyond current Landsat or anticipated LDCM capabilities.

During the public comment session, a recurring theme was impatience with the delays and erratic progress toward creating an operational moderate resolution land imaging program, even though such a program has been stated as a National policy since at least 2004. All open-session comments, as well as all views on the subject expressed by panelists, favored a single Agency lead for the future land imaging program.

The public comments ranged between advocates of a no-cost data policy for moderate resolution land imaging supported by public funds, similar to the data provided by the NOAA National Weather Service, and those who argued for a privatized capability on a cost-recovery fee basis, albeit with U.S. Government backing of unspecified degree and form. The affordability of Landsat data was frequently cited by the user panelists as an essential factor in the mushrooming expansion and diversification of applications in all sectors. The moderator of the second panel, reflecting on the extent and characteristics of the applications described during the first panel, estimated the total economic value of just the current applications as being at least in the billion-dollar range, if not worth tens of billions to the U.S. economy.

Acronyms

AIAA	American Institute of Aeronautics and Astrophysics
ASPRS	American Society for Photogrammetry and Remote Sensing
AVHRR	Advanced Very High Resolution Radiometer
DOD	U.S. Department of Defense
DOI	U.S. Department of the Interior
EOS	Earth Observing System
EOSDIS	EOS Data and Information System
EPA	U.S Environmental Protection Agency
ERTS-A	Earth Resources Technology Satellite A
FBI	Federal Bureau of Investigation
FEMA	Federal Emergency Management Agency
FLI-IWG	Future of Land Imaging Interagency Working Group
GEOSS	Global Earth Observing System of Systems
GIS	geographic information system
GPS	Global Positioning System
IEOS	U.S. Integrated Earth Observation System
LIDAR	Light Detection and Ranging
LDCM	Landsat Data Continuity Mission
MAPPS	Management Association for Private Photogrammetric Surveyors
MODIS	Moderate Resolution Imaging Spectroradiometer
NASA	National Aeronautics and Space Administration
NPOESS	National Polar-orbiting Operational Environmental Satellite System
NSGIC	National States Geographic Information Council
NSTC	National Science and Technology Council
OSTP	Office of Science and Technology Policy
USDA	U.S. Department of Agriculture
URISA	Urban and Regional Information Systems Association
USGEO	U.S. Group on Earth Observations
USGS	U.S. Geological Survey
VAR	value-added reseller
VIIRS	Visible/Infrared Imager/Radiometer Suite

requirement, but future land imaging capabilities need not be limited to Landsat capabilities. A major Working Group task is to tie required technical capabilities back to the societal benefits of land imaging and how they can best be achieved. Among these benefits are the societal benefits defined for IEOS and the international effort known as the Global Earth Observing System of Systems (GEOSS):

- ∞ Weather
- ∞ Natural disasters
- ∞ Ocean resources
- ∞ Climate variability and change
- ∞ Human health
- ∞ Ecological forecasts
- ∞ Agriculture and forestry.

A further set of societal benefits go beyond the GEOSS and IEOS goals, but are important to meet U.S. economic and national security interests. Among these are:

- ∞ Land use planning and management
- ∞ Public lands conservation and management
- ∞ National security operations
- ∞ Transportation planning and management.

The best long-term solutions for operational land imaging capabilities to meet national needs traceable to these benefits may vary over time, so proposed solutions should be flexible. The Working Group anticipates that Government-owned satellites will be the near-term data acquisition solution, combined with a complementary international partnership. Other options being considered for the future include public-private partnerships, international partnerships, a commercial program, and combinations of these approaches. With respect to the management and governance structure overseeing the satellite operations, options under consideration include a single Federal agency responsible for all aspects of land imaging, a multiple-agency structure in which responsibilities are shared, an integrated program office reporting to multiple Federal agencies, a national commission to manage the land imaging program, or a purely commercial or international manager with no Federal agency having responsibility for management or oversight.

Multiple Federal agencies have shared responsibilities for operating Landsat satellites. The process for developing each new satellite has been ad hoc. Each agency also interacts independently with potential partners in the academic community and the private sector (e.g., value-added resellers). The FLI-IWG believes that focused Federal leadership of the land imaging community is essential. Although the land imaging enterprise is too large and complex to be conducted entirely by a single agency, a lead agency is necessary. A designated Federal lead agency can provide unified planning and responsibility for operations. It should have responsibility for coordination among agencies on land imaging needs; data acquisition, quality control, and distribution; and

acquisition of technology and systems. The lead agency would serve as a single point of contact for non-governmental users and contractors, as well as for international partners and international negotiations. The management/governance structure must also provide a point of accountability for performance, while allowing for flexibility in leadership as technical, fiscal, and political factors change. The Working Group thus envisions a National Land Imaging Program with a designated lead agency and a coordinating board with members from each of the agencies participating in the program. An option under consideration is to designate DOI as the lead agency, perhaps with management of the program at the assistant secretary level. DOI has sent a letter to OSTP expressing its interest in such an arrangement. The national program would be a coordinating program and would not subsume the existing land imaging programs of the partnering agencies. Dr. Whitney described how this coordinating role might work with respect to other major Federal initiatives including the U.S. Group on Earth Observations (USGEO) and GEOSS, the programs and projects of individual Federal agencies, and land imaging activities in the private sector.

In closing Dr. Whitney encouraged responses to the ideas and options he had presented. Further information on the FLI-IWG is available on its website (www.landimaging.gov), and views can be emailed to survey@landimaging.gov. He also asked participants to send anecdotes showing the value of land imaging, any qualitative information or quantitative metrics about the value of land imaging in particular sectors, and thoughts on trends in land imaging that may be emerging on the horizon.

Panel 1: Views of the User Community on Future of Land Imaging

Kass Green, moderator for the first panel, thanked the DOI for offering a home for a land imaging coordination program. She thanked the panelists for taking time to participate and the FLI-IWG for their efforts to date, then introduced the panelists and their current affiliations (see box). This panel includes two members from the value-added reseller (VAR) community, two members representing end users of information from the imagery, two users from the nonprofit sector, and one representative of State and local public-sector entities.

Preliminary Results from the ASPRS Survey

Ms. Green began with a summary of the goals, background, and preliminary results to date from the ASPRS survey on the future of moderate resolution land imaging. The goals are to: (1) estimate the societal benefits of U.S. moderate resolution data, (2) better understand current operational and research uses of moderate resolution data, and (3) identify user requirements in moderate resolution technology and data policy. The survey questions were created and reviewed by a team of professionals with input from

Panel 1: Views of the User Community

Kass Green, *Moderator*, President of Alta Vista Company and Vice President, ASPRS

Susan Carson Lambert, past President, National States Geographic Information Council

Jim Schriever, Senior Vice President, Sanborn Solutions

John Brown, President, Aircorp

Doug Hall, President and CEO, MDA Federal

Jennifer Swenson, Andes-Amazon Project Manager, NatureServe

Dan Ferhringer, GIS/Remote Sensing Manager, Ducks Unlimited

William Raichle, Vice President for Risk Decision Information, ISO, Inc.

the FLI-IWG. An email blast requesting responses from their members was sent out by the ASPRS, the Management Association for Private Photogrammetric Surveyors (MAPPS), the Urban and Regional Information Systems Association (URISA), the National States Geographic Information Council (NSGIC), and other entities that maintain email pointcasting lists. As of July 25, the survey, which was first posted on July 5, had 914 respondents from around the globe. The respondents are about equally divided among academic, commercial, and governmental affiliations. The majority of respondents (69 percent) use Landsat data as their primary source of moderate resolution data, 46 percent work in an operational program, and 73 percent stated that Landsat is a primary, critical dataset for their applications. Many of the respondents' programs that use Landsat data were established decades before the first Landsat launch; these programs have incorporated Landsat-derived information as it became available. The varied nature of these operational programs is illustrated by the list in table 1, drawn from the survey responses received to date.

Table 1. Operational Programs Currently Using Moderate Resolution Land Imaging Data

Carbon cycle monitoring	Mineral exploration
Coastal change analysis	Monitoring grant performance
Crop estimates	Range management
Deforestation monitoring	Recreation planning
Design of defense systems	Snow and ice monitoring
Detecting and monitoring volcanic activity	Soil analysis
Ecosystem mapping	Space cartography
Emergency response	Support of DOD operations
Forest management	Water resource planning and administration
Invasive species monitoring	Water rights monitoring
Inventorizing toxic releases	Weather prediction
Irrigation management	Wetlands rehabilitation
Land use and land cover change	Wildland fire risk assessment
Mapping groundwater discharge zones	Wildlife reintroduction

Ms. Green characterized the preliminary data as confirming that a Landsat data gap is already being felt by users. Of the respondents who expressed an opinion about Landsat, 81 percent stated that current Landsat 5 and 7 data do not meet all of their needs, given the current scan line corrector problems of Landsat 7 and the coverage limitations of Landsat 5. Approximately 78 percent of the same respondents stated that, if the scan line corrector failure on Landsat 7 had not occurred, Landsat 7 data would have met their current needs. In order of importance, the top five reasons cited by respondents for using Landsat data rather than other remote-sensing data were that: (1) Landsat data are more accessible; (2) a large Landsat archive exists, containing over 30 years of consistent data; (3) Landsat data are relatively less expensive; (4) Landsat data provide more repetitive coverage; and (5) the extent of Landsat scenes is most appropriate for the respondent's project. Ms. Green highlighted survey results that indicate the quantitative impacts to users if Landsat service were lost. With respect to increasing the utility of moderate resolution imagery, the top five factors for these respondents were (in order of importance) greater spatial resolution, lower-cost data, more frequent temporal coverage, more spectral resolution, and easier access to data.

The survey analysis will include quantitative data on the spatial resolution (in meters) and temporal resolution (in days between re-imaging) desired by respondents, as well as the strength of respondent opinions (from full agreement to strong disagreement) on a set of survey questions regarding management and ownership of land imaging services, the role of the Government, and directions for expanding imaging capability. These quantitative results will be complemented with quotes extracted from individual responses to illustrate the range of applications, societal benefits, and criticality of moderate resolution imagery like that provided by Landsat. Ms. Green's presentation slides included preliminary quantitative analyses from the responses received through July 21, plus a selection of quotes.

Mapping Ecosystems and Deforestation Impacts in Developing Countries

Jennifer Swenson of NatureServe described the range of services performed by this nonprofit network and then focused on how her Andes-Amazon Project is using Landsat vegetation data to map ecosystems and deforestation in South America. Of the 80 Landsat scenes available for Peru, her project is using about 40. About 105 ecological communities will be mapped. Landsat provides a combination of regional coverage with the details needed to perform this ecological mapping and determine the extent and consequences of deforestation. Landsat's repeat coverage is valuable because of the frequent cloud cover in this region, and the data are affordable enough to allow continuous updating. The historical coverage is essential to showing land use changes over time. Any application involving vegetation mapping or ecosystem monitoring in developing countries, such as Peru, is highly dependent on Landsat to provide the base layer mapping, because of the dearth of ancillary data to map the ecosystems.

Wildlife Habitat Conservation Management

Dan Ferhringer described how Ducks Unlimited uses moderate resolution imagery to manage individual wildlife habitats all along the major continental flyways for migratory waterfowl. The combination of full Western Hemisphere coverage and adequate spatial resolution is essential for these applications, which have included mapping of boreal forests in Canada; the prairies, Great Lakes, and Missouri-Mississippi Valley in the United States, and habitats in Mexico, Central America, and South America. The interpreted imagery products that Ducks Unlimited and its affiliated organizations produce allow them to set priorities and make the best use of their limited resources. The products are also used in their work with Federal, State, and foreign governments on conservation and wildland management priorities, with agricultural and forestry companies on land resource management, and with nongovernmental organizations. Mr. Ferhringer gave examples of activities and programs that have been supported with his habitat analysis products, together with the societal benefits from these activities.

Value Added Products Supporting Defense and Civil Agency Missions

Doug Hall of MDA Federal (formerly Earth Satellite Corp.) said that his company has been processing Landsat data since the early 1970s. The company's clients include 13 agencies and organizations in the Department of Defense (DOD) and the intelligence

community; multiple entities within the DOI, Department of Commerce, and Department of Agriculture; the U.S. Environmental Protection Agency (EPA); the Federal Emergency Management Agency (FEMA) in the Department of Homeland Security, the National Aeronautics and Space Administration (NASA), and entities in State government and the private sector. The combination of comprehensive coverage at regional to national scales and moderate resolution is essential to many of the applications MDA Federal supports, including those shown in table 2. Although MDA Federal also works with high-resolution data from both defense/intelligence sources and the private sector, Mr. Hall emphasized that those datasets complement, rather than replace, the role of moderate resolution imagery such as Landsat provides. Recent projects illustrated in the presentation slides included land use change detection on the Gaza-Egypt border and illicit crop inventory (opium poppy cultivation) in one province of Afghanistan. Another recent project compared the areas of the Indian Ocean affected by the December 2004 tsunami with pre-tsunami scenes, to highlight alterations of coastline and underwater hazards. In closing, Mr. Hall stressed the need for an operational moderate resolution land imaging capability to support Federal agency activities.

Table 2. Value-Added Applications of Moderate Resolution Imagery to Support Federal Missions

Civil Agencies	DOD/Intelligence Community
Land cover mapping	Change detection
Change detection/monitoring	▪ Intelligence tip-offs
Disaster response	▪ Monitoring
Humanitarian relief	▪ Map updating
Geologic mapping	Illicit crop assessment
Forestry assessment	Food security
Agricultural assessment	Land cover mapping
Wetlands mapping	Shoreline/hazards mapping
Fire risk assessment	Infrastructure mapping
Impervious surface mapping	
Environmental monitoring	

Source: MDA Federal

Applications Used by State and Local Governments

After an overview of her career as a land surveyor, cartographer, and geographer with the USGS and as a principal investigator for state projects in Kentucky, Susan Carson Lambert said that the States are major users of Landsat data. She urged the FLI-IWG to ensure that the views of State agencies and offices are surveyed. From a much larger set of applications that her contacts in State and local government had sent her, she presented the representative, but partial list of applications shown in table 3. After describing details for several of the listed applications as they are used by State and local entities, Ms. Lambert stressed that all of these applications represent mandated activities required of State and local governments.

In a study Ms. Lambert conducted of non-Federal public sector needs for data, Landsat data and moderate resolution imagery were in the bottom quartile (lowest 25 percent) for the entire range of public sector entities. However, for State agencies with

responsibilities for resource use or management, Landsat data were always in the top five data needs. Another difference is that entities in states east of the Mississippi often wanted imagery with higher resolution than Landsat, whereas states west of the Mississippi, where the land areas to be monitored or managed are much larger, are typically content with the current Landsat resolution and use the products routinely. She has also observed that the extent to which State entities make use of imagery data and products often depends on their interactions with Federal counterparts, who show them how the data and products can be used.

Table 3. State and Local Applications of Moderate Resolution Imagery Data

Agricultural field crop health	Modeling of rock formation
Comprehensive plan efficacy monitoring	Preliminary analysis for logging species
Crop insurance verification	Rangeland health and change
Forest canopy mapping	Riparian zone mapping
Forest fire scar mapping	Risk management for post-forest fire stream siltation, mud slides & erosion and mud-slides
Forest fire susceptibility mapping	Sensing of lava flows
Forestry composition and forest composition change	Water quality analysis
Imperviousness mapping	Watershed analysis for modeling
Insect damage mapping i.e. pine beetles	<ul style="list-style-type: none"> ▪ Modeling watershed capacities ▪ % development before ecosystem damage
Invasive species mapping	Wetland mapping
Land cover change analysis	Wetness/drought analysis
<ul style="list-style-type: none"> ▪ Comprehensive plans ▪ Logging effects ▪ Mining effects ▪ Efficacy of mine reclamation 	Wildlife management
Land management decisions	Wildlife habitat analysis
Mineral exploration (State geologic surveys)	

For non-Federal public sector entities, Ms. Lambert said in closing, the benefits of Landsat products are that they are affordable and shareable (e.g., among State agencies and from them down to local entities); the bands are usable by many applications these entities have, there is a great deal of supporting science behind the data (algorithms, classification, indices, etc., that can be applied); there is a long period of record for applications such as land use change over time; and Federal agencies support the State and local entities with best practices for using and interpreting Landsat data. The principal downside she hears from colleagues in these entities is that they want higher resolution.

Applications of Landsat Imagery in Legal Proceedings

John Brown is President of Aircorp, which stands for Agricultural Investigation Research Corporation. He described applications of Landsat data in his work as a legal expert witness in Federal and State courts. One example is agricultural fraud detection related to loss claims made under the crop insurance program of the U.S. Department of Agriculture (USDA). He also uses Landsat data as evidence of the impact of human activities on property and land resources, in investigations of water sources and water rights, and for detection of water leaks from pipelines. Clients include the Risk Management Agency in USDA, the U.S. Department of Justice, insurance companies, and local governments.

Among the societal benefits that Mr. Brown sees from his company's uses for Landsat data are fraud detection, finding and ensuring appropriate use of water resources, reducing exposures to chemicals and pesticides, and crop development (precision farming). Another set of benefits relate to detection of the impact of disasters such as Hurricane Katrina, including facilitation of rescue (for example, farm animals) and recovery and for quantifying damages for purposes of compensating for losses.

Important characteristics of Landsat data for legal proceedings are its reasonable cost, ease of access, the extensive historical archive (going back to 1972), and its established record and wide acceptance in the scientific community (proven technology). Ease of access is important because court deadlines are demanding; there are no excuses for failing to meet a Federal court deadline. Although Aircorp's range of applications could use higher resolution, Mr. Brown finds that 30 m resolution is workable. The multi-band algorithms are very important for his work. In addition to the data's established scientific basis, acceptance in court proceedings is aided by the documented chain of custody of the data and the reliability of the data protocols. Mr. Brown also finds that basic analysis techniques for Landsat data are easily taught to clients.

Commercial Land Cover Mapping

Jim Schriever began with a brief history of Sanborn, where he is Senior Vice President of the Sanborn Solutions division. The company was started in 1866 by a Civil War cartographer and initially produced detailed city maps for fire insurance companies. Sanborn still provides subscription mapping services. In addition to its applications of satellite imagery, the company owns a fleet of aircraft with digital and analog airborne sensors and LIDAR for high-resolution mapping products and services. In the moderate resolution area, Landsat is their "workhorse" observing system, although they also use commercial satellite imagery. Mr. Schriever views Sanborn's regional presence, with offices located in a number of states, as an important asset when working closely with clients on applications that are pushing the limits of imagery interpretation. Sanborn's land cover mapping philosophy emphasizes the capability needed not just for imaging, but to put the image data to use. Consistent core funding for some of the baseline applications of Landsat data, he said, is critical for putting that data to work. Coordination of collaborations among State and local public sector entities, Federal agencies, and commercial partners is central to this philosophy. Sanborn has been able to leverage the investment of Federal resources with State resources to the extent that State partners have provided up to \$10 in funding for every \$1 of Federal funding. Across the board, Sanborn has been able to coordinate partnerships to at least match the Federal contribution, dollar for dollar, with State money.

Other tenets of Sanborn's philosophy are attention to data quality and consistency and the capacity to deliver cost-effective, timely solutions to customers. To illustrate how quality and consistency apply to Landsat data, Mr. Schriever described the successful application of 30 m resolution data to mapping of wildfire fuels in Florida, where better than 90 percent accuracy was achieved. Moderate resolution imagery is often key to providing a timely and cost-effective solution, compared with the prohibitive cost and schedule time required for regional-scale mapping with high resolution datasets. Examples Mr. Schriever cited were species-specific habitat maps of the entire West

Coast, produced within 9-12 months to meet requirements of the Endangered Species Act. Land cover mapping applications for which moderate resolution imagery provides cost-effective, timely solutions of high quality include the following:

- ∞ Fire risk management (e.g., fuels and canopy closure analyses)
 - Fire susceptibility indices are being used in 15 states.
 - Datasets for the National Landfire Program will be based on 2001 imagery.
 - Community Wildfire Protection Plans (CWPP's) for communities at high risk of wildfire losses will probably need higher-resolution data added to a state-level synoptic view.
- ∞ Consistent national datasets (time series) are essential to establish historical baselines needed for:
 - Trend analysis
 - Change detection.
- ∞ Global crop analyses
- ∞ Cumulative effects analyses
 - First approximation reports
 - Response to requirements under the Endangered Species Act
- ∞ Monitoring outbreaks of insects and diseases

In his closing slide, Mr. Schriever presented and discussed an analysis developed for the American Forest Organization. Time series images from the USGS National Land Cover Dataset are used to analyze land cover changes, which in turn can be linked to quantitative changes in tons of air pollutants removed by forested areas, tons of carbon sequestered in biomass, amounts of water retained in soils rather than lost to runoff, and other ecosystem factors. Without the Landsat sensors and the data they provide, such analyses would not be possible.

Risk Management Applications for the Insurance, Finance, and Health Industries

William Raichle described the work of his company, ISO, as helping customers measure, manage, and reduce risk. Its products help customers identify, mitigate, and price for risk by providing them with data, analytics, and decision-support services. The information Mr. Raichle presented about ISO's business is also available on its website at http://www.iso.com/about_iso/. Part of ISO's business is to collect premium and loss data for commercial insurance transactions and to help insurance companies determine loss cost for their business lines. For example, ISO promulgates the fire suppression schedules for firefighting entities across the Nation. These schedules are used in setting property insurance rates. ISO also maintains databases on commercial properties for purposes of insurance underwriting. Its insurance claimant database is used by the insurance industry and the Federal Bureau of Investigation (FBI) to detect insurance fraud.

ISO maintains the largest geographic information system (GIS) in the insurance industry, containing 25 database products. One of the databases that depends on satellite imagery is FireLine, which contains information on the wildfire hazard for purposes of property insurance. Although not a major fire loss risk, wildfire losses are significant for the industry and they are increasing. From 1985 to 1994, wildfires destroyed more than

9,000 properties nationwide, including the 2,449 dwellings destroyed in the Oakland/Berkeley Hills fire of October 1991, causing an estimated \$1.5 billion in damage. A decade later, the southern California firestorms in October 2003 destroyed 3,400 structures and caused more than \$2 billion in insured property losses. The FireLine database, which uses Landsat data for its “Fuel” layer, grew out of the inadequacy of more traditional hazard mapping methods to cover large regions. Once interpreters with sufficient expertise with the Landsat data were found, ISO was able to identify and assess the urban-wildland interface consistently and reliably with a cost-effective program. For example, 97.5 percent of the burned area from the 2003 southern California fires had been identified in the FireLine database as exposed to a wildfire hazard, and 95.7 percent of the homes affected by those fires had been identified as exposed. Insurers prefer to base ratings on data from a shared, accurate, and consistent source, such as Landsat data, rather than on proprietary data or conflicting interpretations.

Panelist Responses to Questions on Future Land Imagery Planning

After Mr. Raichle’s presentation, Ms. Green asked the panelists what they thought was the most important thing the FLI-IWG needs to know about user needs for future moderate resolution land imagery.

Doug Hall said that imagery and data from sources representing a range of resolutions will be necessary. Although a commercial industry supplying high-resolution land imagery and data is emerging, that alone will not meet all users’ needs. He also said there are frequent misperceptions about the source of value-added imagery products offered by VARs, when their data originate from Landsat data.

Jennifer Swenson stressed the importance of international applications for moderate resolution imagery. The low expense, comprehensive coverage, and other attributes of the Landsat data are even more critical in other countries that lack access to any alternatives for many of the applications enabled by moderate resolution satellite imagery.

John Brown said the most important thing for him were the benefits to the American farmer. Modern farming requires this kind of moderate resolution, inexpensive, and dependable data. Increasingly, farmers use such data to conserve energy, lessen environmental damage, and protect their crops. A weekly interval for re-imaging would be important to farmers, but the most important qualities are dependability and reliability.

Jim Schriever agreed with points the previous speakers had made and added that continuity of land data over time, building on the Landsat heritage, was important for many applications. In addition to Federal support for imaging and image archiving, Federal support for a land mapping capability through an operational, continuously funded program is important to realize the potential benefits of the multitude of applications.

Susan Carson Lambert also agreed with the points the other panelists had stressed. She emphasized that U.S. cities and its 3,300 counties and parishes need the data provided by moderate resolution land imaging. The program must maintain accessibility

