

**NSDI Cooperative Agreements Program
Geographic Information Integration and Analysis
Project Report**

2005 Chicago Urban Area Orthophotography Accessibility through The National Map

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Data Theme: 2005 Orthoimagery for the Chicago Urban Area

Project Summary

a.1 Describe the project; its tasks, highlights, challenges, and accomplishments.

The focus of this effort was to make the 2005 Chicago Urban Area (CUA) data files in Universal Transverse Mercator (UTM) Zone 16 available via a simple download interface on-line, free-of-charge, at the Illinois Natural Resources Geospatial Data Clearinghouse (Illinois Clearinghouse) and also to make the data available at The National Map. The Illinois Clearinghouse is a web site for distributing digital map data for the State of Illinois found at www.isgs.uiuc.edu/nsdihome/. It is managed by the Illinois State Geological Survey (ISGS) in Champaign, Illinois. On-line since 1997, the Illinois Clearinghouse has become a vital resource for professionals working with GIS, remote sensing, and CAD software.

The CUA data set arrived at the ISGS on March 1, 2006. The data set is comprised of 8,892 data tiles created in two distinct data projections, UTM Zone 16 and Illinois State Plane Zone East (SPE). Both data sets reference the North American Datum of 1983 (NAD83). In total, the uncompressed files require 630 gigabytes of disk space and the compressed files require 79 gigabytes. Project staff processed all geo-referenced images in both data projections through a complex production workflow (see Table 1). Each imagery file is supplemented by a suite of six files; five of the six files were generated by ISGS staff members. A seamless data mosaic was created by loading the uncompressed UTM data into an ArcSDE database, requiring 1.2 terabytes of disk space, to support the project ArcIMS map service.

Compressed CUA data files were made available on-line April 27, 2006 in MrSID generation 2 .sid compressed file format; the CUA05 ArcIMS Map Service was publicly released on November 27, 2006. During the first six months of availability, a total of 711,114 data files were downloaded from the Illinois Clearinghouse. This represents an average of 3,783 files per day. By far, the highest demand came in August, with an average of 8,612 files downloaded per day. This is a

signature achievement; the Illinois State Geological Survey was providing over 8,600 in-demand products to customers within Illinois, the Midwest, and the United States on a daily basis.

a.2 What are your approaches to overcoming impediments to participation in The National Map? Based on your experience what would you recommend for implementation and development for project success (technical, institutional and organizational)?

Our primary impediment for participation in The National Map is lack of on-going, programmatic funding for the Illinois Clearinghouse. There is a real need for federally funded programs that are designed to create framework data, like regional or statewide orthoimagery, to require a commitment to fund data distribution prior to data creation. For a description of recommendations for technical impediments, see section *d.* below.

b.1 Describe the data themes provided through The National Map. Are there any use restrictions?

During the spring of 2005, contractors working for the U.S. Geological Survey (USGS) began collecting detailed aerial imagery for a six-county area of northeastern Illinois. The Chicago Urban Area includes the counties of Cook, DuPage, Kane, Lake, McHenry, and Will in northeastern Illinois.

Data tiles are available download free-of-charge at the Illinois Clearinghouse. Although the original specifications for this project only encompassed the UTM data collection, data in both UTM Zone 16 and SPE projections are accessible. There are no use restrictions for the data.

b.2 Are your map services and data documentation (metadata) registered in The National Map and Geospatial One-Stop?

Completed tasks have consistency with The National Map and applicable Geographic Information Standards endorsed by the FGDC, the International Organization for Standardization, and the OGC. Applicable standards include: FGDC CSGDM (FGDC-STD-001-1998), Metadata Service Guidelines for harvestable documentation, OpenGIS Consortium Web Map Service Specification (Version 1.1.1), and INCITS Project 1574-D Content Standard for Digital Orthoimagery. 2005 Chicago Urban Area project data are currently registered and available via The National Map. USGS data archival and delivery procedures routed all files through the Earth Resources Observation and Science (EROS) center in Sioux Falls, South Dakota prior to delivery to Illinois state agencies. Technicians at EROS have established an OGC-compliant map service of 2005 CUA data to The National Map. Additionally, an ArcIMS map service has recently been developed and released for public access at the Illinois Clearinghouse.

The Illinois Clearinghouse is a formally established node in the National Spatial Data Infrastructure (NSDI) network. FGDC compliant metadata are available for all data layers, data collections, and map services. An upgrade of zserver software from Isite 2.07i to Isite 2.2.3 has brought our data catalog into compliance with Geospatial One-Stop specifications.

b.3 What is the status of maintaining, updating and serving themes of data that are included in The National Map? Based on your perspective and project experience describe user requirements for a national level spatial data infrastructure.

An upgrade of ArcIMS software and establishment of the WMS Connector for ArcIMS will enable our agency to upgrade all existing map services to OGC compliance. We anticipate this development will be complete in early 2007. Services include file viewing and access to 2005

CUA project data, 2005 DOQQ data, 1998/1999 DOQQ data, and Illinois Historic Aerial Photographs (ILHAP) from the late 1930's and early 1940's for 51 counties.

The ISGS has proven to be successful at securing project-based funding to expand the Illinois Clearinghouse data catalog with framework data over the past nine years. Efforts to provide on-line access to 2005 Chicago Urban Area orthoimagery and 2005 Digital Orthophoto Quarter Quadrangle data were supported by this Federal Geographic Data Committee project, and also by funding from the Illinois Department of Public Health, Illinois Department of Military Affairs, Illinois Environmental Protection Agency, Illinois State Geological Survey, and the United States Geological Survey. However, securing funding for overall maintenance of the Illinois Clearinghouse has proved challenging. The software improvements and hardware purchased from the overall 2005 orthoimagery data distribution effort has ensured the continuing availability of current holdings for the next three to six years. Future additions of framework data for Illinois are uncertain until stable funding can be secured.

c. Describe the operational capability to maintain and update data through periodic updates of data made available through The National Map.

The ISGS is a recognized leader within the mapping, GIS, and remote sensing user communities in Illinois. Our agency has been using GIS software for over twenty years; many staff members routinely use GIS technology. The ISGS has embraced an enterprise approach to GIS data management; maintenance and update of data resources and ongoing development of the Illinois Clearinghouse are agency priorities.

The ISGS has been successful in attracting support for steady expansion of the states' on-line data catalog. Available files include statewide USGS Digital Raster Graphic files in three scales and four projections (over 4,400 files), DOQQ data from 1998/1999 (over 4,100 files), and ILHAP files (over 16,000 prints). All data resources are supported by documentation compliant with the FGDC Content Standard for Digital Geospatial Metadata, Version 2 (CSDGM), FDGC-STD-001-1998. Projects have been sponsored by the FGDC, USGS, Illinois Department of Natural Resource's Conservation 2000 initiative, Illinois Waste Management and Research Center, University of Illinois On-Line program, Illinois Council on Food and Agricultural Research, U.S. Army Corps of Engineers, U.S. Geological Survey, and the Institute of Museum and Library Sciences.

The backbone of the ISGS computing environment includes high-end Sun and Dell servers with substantial disk storage. The ISGS maintains a regular backup schedule for all systems; our agency disaster recovery plan includes on- and off-site storage of backup tapes. The ISGS is located on the University of Illinois campus, which enjoys fast and dependable network connections. The Illinois Clearinghouse runs on a dual-processor Sun server that has a 100MB connection to the Internet; a new Sun server was purchased for this effort with funds from the sources listed above. The new server has the capability to store over 4 terabytes of data. Oracle and ArcSDE 9.0 server software have been installed; the server is designed to house all ISGS base imagery data and become a dedicated server for ArcIMS driven map services supported by the WMS Connector for ArcIMS.

The ISGS is committed to continued operation of the Illinois Clearinghouse. On-line access to 2005 Chicago Urban Area digital orthophotography fulfills a significant near-term goal for data catalog expansion. Enabling the Illinois Clearinghouse to meet Geospatial One-Stop and The National Map technical requirements, and leverage project funds to attract funding for the new data server, has worked to sustain access to all Illinois Clearinghouse data holdings for the next three to six years.

d. Discuss the issues, difficulties, and challenges (both technical, institutional and organizational) that were encountered. How can the CAP program be improved.

The greatest difficulties in completion of this project were primarily technical in nature, related to establishing compliance with Geospatial One-Stop and OpenGIS Consortium requirements for web map services. The CAP program would be greatly improved if an overview of specific steps needed to establish these compliances were provided at the Kick-Off meeting, along with technical demonstrations on how install and configure software components. At the Kick-off meeting, most attendees were primarily concerned with these issues and expecting this sort of guidance. However, no technical presentations were offered by FGDC and USGS staff at the kickoff meeting.

e. Describe your relationship and issues with the USGS. Has a formal ongoing agreement been established to provide data and web services through The National Map? Describe your plans for follow-on activities. What are the terms and mutual commitment of resources? Please attach copy of written agreement if available.

The Illinois State Geological Survey and staff members involved in the maintenance of the Illinois Clearinghouse have enjoyed a long and prosperous relationship with the USGS. For the majority of this project, ISGS staff worked closely with Richard Vraga, the USGS Liaison for Wisconsin and Illinois. Mr. Vraga helped the ISGS to secure funding for two follow-on activities. These are: "Expansion of the Illinois NSDI Node" and "State of Illinois Geospatial Coordination Planning." Together, these projects are designed to strengthen the capability of the Illinois Clearinghouse to provide additional data and web services through the National Map, and also to establish a more formal relationship between state agencies and the USGS through written agreements. Both of these projects extend from September, 2006 through September, 2007.

Recently, the state of Illinois was assigned a dedicated USGS Liaison, Shelley Silch. Ms. Silch's office is located in close proximity to the ISGS, in Urbana, Illinois. We anticipate that this development will offer unprecedented opportunities to collaborate on data distribution projects with the USGS.

TABLE 1: Production Workflow for 2005 Orthoimagery On-Line Distribution

- Create project overview web resources
- Post project level web resources at Illinois Clearinghouse; provide timely updates

- Research file compression software packages and output file formats
- Identify target compression ratio for CUA data

- Receive data .tif imagery and .xml documentation files from USGS
- Establish file archive directory structure
- Copy data from drives onto server
- Move data files into archive sub-directories
- Assign project intern to QA/QC 10% of original data files
- Change ownerships and permissions of data file directories to ISGS Database Manager
- Initiate file back-ups

- Implement file compression to generate .sid image files and .sdw geo-referencing files
- Create .aux geo-referencing files
- Change ownerships of compressed data and support files to ISGS Database Manager
- Initiate back-ups of original and compressed data files

- Create downloadable .zip file bundles
- Transfer .zip file bundles to Illinois Clearinghouse server

- Obtain file indexes
- Modify file indexes
- Obtain/create collection level metadata

- Create supporting .tfw files for UTM .tif file data loading into ArcSDE
- Implement data loading into ArcSDE
- Assign project intern to QA/QC .tif file footprints against ArcSDE for 10%
- Implement data pyramiding in ArcSDE
- Initiate ArcSDE data mosaic back-ups

- Create file access web pages
- Release file access web pages for public access

- Develop project map document (.mxd)
- Develop project ArcIMS interactive map web resources
- Establish OGC compliant web map service
- Release map services for public access