CALL FOR PARTICIPATION IN MISSOURI'S I - TEAM

It is critical that geospatial information assets are created, maintained, and made available to those who need them for analysis of issues and decision-making. At the national level, the White House Office of Management and Budget (OMB) proposed a new initiative referred to as Implementation Teams (I-Teams). A state I-Team provides an opportunity for public and private agencies to form mutually beneficial partnerships to build the framework data layers for the National Spatial Data Infrastructure (NSDI).

Missouri's I-Team will write a plan which will define a process based on planning and policy issues for prioritizing data themes that will contribute to building the NSDI and provide a summary of the data themes that will be included in the prioritization process. It will address issues and information needs statewide for Missouri and reflect the collaboration of all interested parties.

The Missouri Geographic Information System Advisory Committee (MGISAC) has agreed to serve as the I -Team for the state. The MGISAC is composed of members from state, federal, and local government agencies and educational institutions. Subcommittees will be formed for each theme and will be made up of volunteers from federal, state, and local government agencies, educational institutions, and the private sector. The following themes were chosen to be included in Missouri's plan: boundaries, cadastral, digital ortho-imagery, elevation, geodetic control, hydrography, transportation, geology, land use/land cover, soils, and critical infrastructure. If you would like to participate in one of the subcommittees, please contact the Missouri Spatial Data Information Service at msdis@missouri.edu. Additional information about I-Teams is available at http://www.fgdc.gov/I-Team.

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THEME SUMMARIES

Geodetic Control

"Geodetic control provides a common reference system for establishing the coordinate positions of all geographic data. It provides the means for tying all geographic features to common, nationally used horizontal and vertical coordinate systems. The main features of geodetic control information are geodetic control stations. These monumented points (or in some cases active Global Positioning System control stations) have precisely measured horizontal or vertical locations and are used as a basis for determining the positions of other points. The geodetic control component of the framework consists of geodetic control stations and related information -- the name, feature identification code, latitude and longitude, orthometric height, and ellipsoid height, and metadata for each station. The metadata for each geodetic control point contains descriptive data, positional accuracy, condition, and other pertinent characteristics for that point. Geodetic control information plays a crucial role in developing all framework data and users' applications data, because it provides the spatial reference source to register all other spatial data. In addition, geodetic control information may be used to plan surveys, assess data quality, plan data collection and conversion, and fit new areas of data into existing coverages." [1]

A database of existing horizontal and vertical geodetic control is currently maintained by the Land Survey Program of the Geological Survey and Resource Assessment Division (GSRAD) of the Missouri Department of Natural Resources (MDNR). Geodetic Control is obtained from the National Geographic Reference System established by the National Geodetic Survey and from the Missouri Geographic Reference System established by the Land Survey Program of the Geological Survey and Resource Assessment Division of the Missouri Department of Natural Resources. The Missouri Geographic Reference System contains all horizontal and vertical control stations found in the National Geographic Reference System in Missouri as well as those established by the Land Survey Program.

Orthoimagery

"Orthoimagery provides a positionally correct image of the earth. An orthoimage is a georeferenced image prepared from an aerial photograph or other remotely sensed data from which displacements of images caused by sensor orientation and terrain relief have been removed. An orthoimage has the same metric properties as a map and has a uniform scale. Digital orthoimages are composed of an array of georeferenced pixels that encode ground reflectance as a discrete digital value. Many geographic features, including those that are part of the framework, can be interpreted and compiled from an orthoimage. Orthoimages can also serve as a backdrop to reference the results of an application to the landscape.

[1] Page 18, "Framework Introduction and Guide," Federal Geographic Data Committee, Washington D.C., 1997.

The framework may include imagery that varies in resolution from submeter to tens of meters. Accurately positioned, high-resolution data (pixels of 1 meter or finer) are presumed to be the most useful for supporting the compilation of framework features, particularly those that support local data needs. In some areas, lower-resolution imagery may be sufficient to support the framework and applications. Orthoimagery provides a useful tool for a variety of applications. Because many land features can be seen on an orthoimage, it can serve as a backdrop for visual reference purposes, saving the expense of creating vector files of features that are needed only for reference. Orthoimagery can be used to compile vector themes photogrammetrically." [2]

Elevation

The FGDC "Framework Introduction and Guide" defines elevation data on page 19 as: "Elevation data provide information about terrain. Elevation refers to a spatially referenced vertical position above or below a datum surface. The Framework includes the elevations of land surfaces and the depths below water surfaces (bathymetry)."

The elevation data models commonly used in Missouri include the USGS Digital Elevation Model (DEM) collected in 10 or 30 meter grid spacing originally collected from the standard USGS 7.5-minute quadrangle map contour separate, now available in a seamless grid of the state. Other examples of elevation data include a vector digital file of the USGS contour separates being collected by the Missouri Center for Agricultural and Environmental Systems (CARES) in cooperation with USGS. This Hypsography data can be used to produce a DEM of any post spacing, although the contour separates do not provide the source for better than a 10-meter DEM.

Primary sources for DEMs are the USGS and U.S. Department of Agriculture Forest Service (FS). DEM data is available at: http://msdis.missouri.edu/data.html, USGS data, both in 7.5-minute format, and seamless data from the National Elevation Dataset is available at: http://edcwww2.cr.usgs.gov/

The hypsography Digital Line Graphs (DLGs) being produced by CARES are a potential source for 10-meter DEMs with additional processing.

Transportation

"The framework's transportation data include the following major common features of transportation networks and facilities:

- roads -- centerlines, feature identification code;
- trails -- centerlines, feature identification code;

[2] Page 18, "Framework Introduction and Guide," Federal Geographic Data Committee, Washington D.C., 1997.

- railroads -- centerlines, feature identification code;
- waterways -- centerlines, feature identification code; and
- airports and ports -- feature identification code and name…." [3]

Currently, this plan will focus on roads only.

The Missouri Department of Transportation (MoDOT) is the custodian of the state's roadway coverage, which is based on a dynamic segmentation model. Dynamic segmentation models linear features using routes and events, associating multiple sets of attributes to any portion of a linear feature. The Dynamic Segmentation model is used to reference specific data or events (functional class, accidents, pavement type, speed limit, signage, etc.) to locations along a route or travelway, allowing more specific analysis or modeling. MoDOT refers to a "route" as a travelway. A travelway is a publicly used path or corridor for movement of vehicles, goods, and/or people. A travelway can be a road, a bike path, a waterway, a railway, etc.

The state system of travelways consisting of Interstate routes (IS), US numbered routes (US), Missouri numbered routes (MO), and Missouri lettered routes (RT), originated from 1980-Dual Independent Map Encoding (DIME) data, and has been updated with 1995 Topologically Integrated Geographic Encoding and Referencing (TIGER) files from the US Census Bureau. Currently the coverage is updated monthly utilizing design plans, GPS, DOQQ and county and city maps. Spatial resolution of this data is generally considered 1:100,000, updates are frequently made using much more accurate means (ex. GPS, DOQQ).

Data in the MoDOT enterprise database comes from several sources. All of the data originally came from existing files (known as the legacy system) such as signal inventories, bridge inspection and inventory files, and accident records, etc.

MoDOT's Transportation Management System (TMS) is an automated system for bridge, pavement, safety, and congestion management; traffic monitoring; travelway features; and travelway maintenance. TMS offers a number of queries and reports that have already been designed based on requirements identified by MoDOT employees. These canned queries and reports are available through Impromptu and ArcView.

Hydrography

"Framework hydrography data include surface water features such as lakes and ponds, streams and rivers, canals, oceans, and shorelines. Each of these features has the attributes of a name and feature identification code. Centerlines and polygons encode the positions of these features. For feature identification code, many federal and state agencies use the Reach scheme developed by the U.S. Environmental Protection Agency.

[3] Page 19, "Framework Introduction and Guide," Federal Geographic Data Committee, Washington D.C., 1997.

Many hydrography data users need complete information about connectivity of the hydrography network and the direction in which the water flows encoded in the data. To meet these needs, additional elements representing the flow of water and connections between features may be included in framework data.

A shoreline is the intersection of the water's surface with land. It usually is referenced to some analytically determined stage of the tide for coastal water, or other water level for lakes and rivers. Several shorelines, referenced to different stages of the water such as "mean high water" and "mean lower low water," are included in the framework. These shorelines are included because different users require different shorelines and the complex, nonlinear relationships between various shorelines make it difficult to determine them analytically. Attributes include the description of the tidal reference for the shoreline.

Hydrography is important to many applications. As with other data themes, many users need hydrographic features as reference or base map data. Other applications, particularly environmentally oriented analyses, need the information for analysis and modeling of water supply, pollution, flood hazard, wildlife, development, and land suitability" [4]

Governmental Units (Boundaries)

The framework includes the geographic areas of units of government. These units include

- the nation,
- states and statistically equivalent areas,
- counties and statistically equivalent areas,
- incorporated places and consolidated cities,
- functioning and legal minor civil divisions,

Each of these features includes the attributes of name and the applicable Federal Information Processing Standard (FIPS) code. Features boundaries include information about other features (such as roads, railroads, or streams) with which the boundaries are associated and a description of the association (such as coincidence, offset, or corridor). Governmental unit boundaries are used for a wide variety of applications. Some need the boundaries only for information and orientation; others require the polygons to determine inclusion related to a number of other features. Business GIS is a very active field that uses these boundaries for statistical analysis and decision making."[5]

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[4] Page 20, "Framework Introduction and Guide," Federal Geographic Data Committee, Washington D.C., 1997.

[5] Page 20-21, "Framework Introduction and Guide," Federal Geographic Data Committee, Washington D.C., 1997.

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Cadastral Information

"Cadastral information refers to property interests. Cadastral data represent the geographic extent of the past, current, and future rights and interests in real property. The spatial information necessary to describe the geographic extent and the rights and interests includes surveys, legal description reference systems, and parcel-by-parcel surveys and descriptions.

Two aspects of cadastral information are included in the framework:

- cadastral reference systems, such as the Public Land Survey System (PLSS) and similar systems for areas not covered by the PLSS, and
- publicly administered parcels, such as military reservations, national forests, and state parks.

Features include the survey corner, survey boundary, and parcel. Each instance of a feature has the attributes of name (or other common identifier) and information about data quality. Each instance also should have a permanent feature identification code. For the PLSS, the minimum content is the boundaries of sections, including deflection points and the positions for quarter corners along section boundaries. Boundaries that have been surveyed are the preferred content for cadastral reference systems.

Cadastral information is the basis of many analysis, decision-making, and operational applications, such as site selection, land use administration, and transportation planning. The reference system can be used to register locally produced information into the framework. Information about publicly owned lands serves both those who administer the lands and those who have interests in them. Framework representation of these lands provides useful information about their location, boundaries, extent, and relationships to other geographic features and phenomena. Because parcels play an important role in many public and private sector activities, and parcel information is a basic ingredient of many applications, there is interest in providing multiple levels of cadastral data. These levels would be based on available data and customer requirements. The framework provides a means to link existing parcel data into the larger cadastral network."[6]

A database of corner documents pertaining to corners of the US Public Land Survey System (USPLSS) is currently maintained by the Land Survey Program of the GSRAD of the MDNR. In addition, the Land Survey Program is developing an improved USPLSS data layer based on the original layer obtained from the United States Geological Survey (USGS) and using coordinate data from the corner document database to improve the location of the section, township and range lines. Currently, there are approximately 70,000 corner documents in the database, of which something less than 10 percent have state plane coordinates associated with them. The Land Survey Program is currently developing methods to obtain coordinate data for those documents that do not have

[6] Page 21, "Framework Introduction and Guide," Federal Geographic Data Committee, Washington D.C., 1997.

coordinate data listed and to qualify the accuracy of the coordinates on those documents that do have coordinate data.

These corner documents come from a variety of sources to include government agencies such as the Missouri Dept of Conservation, the US Corps of Engineers and the US Forest Service as well as those generated in house by the Land Survey Program, but the bulk of these documents are submitted by professional land surveyors throughout the state.

Accuracy standards for the determination and publication of coordinates on these corner documents in Missouri are specified in Minimum Standards For Property Boundary Surveys as published jointly by the Missouri Board for Architects, Professional Engineers and Land Surveyors and the MDNR (4 CSR 30-16 & 10 CSR 30-2) and Mapping Standards (10 CSR 30-6) published by the MDNR.

Geology

The geology theme can be broken down into three basic subsections: (1) geologic maps of surface exposures, (2) geologic hazard maps, and (3) surficial materials maps. Other specialized geologic maps, such as structural features maps, karst geology maps, mineral resources maps, etc. are not considered basic geology themes and are not considered here, although they may merit inclusion in the future.

Geologic maps of surface exposures are the "standard" geologic maps that form the basis for most specialized geologic maps and studies of large or small areas. The Geological Survey and Resource Assessment Division of the MDNR focuses on three standard scales of geologic maps: 1:500,000 (state map), 1:100,000 (30'x60' quadrangle bases), and 1:24,000 (7.5' quadrangle bases). Each scale has different uses, and eventually all three should be completed in GIS format.

Geologic hazards include earthquakes, landslides, and sinkhole collapse. Emergency management officials use maps depicting geologic hazards both in attempting to mitigate hazards before emergency events and in planning for response and recovery operations after an earthquake or other geologic event. Geologic hazards are also important to consider in land-use regulation and urban development. City and county planners, transportation officials, developers, planning and engineering consultants and many others use geologic hazards maps in making land-use planning decisions.

Land Use

In Geographic Information Systems (GIS) applications, the use of land surfaces by man for human activities is referred to as land use, while the natural and manmade features of the land itself are referred to as land cover. Whether the data is to be used for new highway construction planning, habitat protection, or the location of a new school, more and more government officials are relying on land use land cover (LULC) data to help their planners and administrators provide them with the information they need to make important decisions.

The demand for large-scale LULC information has increased recently, especially in rapidly growing metropolitan areas. Many Federal, State, regional, and local planning agencies require up-to-date LULC information for various applications. These applications include modeling urban growth, determining land suitability for future development, monitoring how land use changes affect the environment, understanding land use patterns, and developing policies concerning land use development.

To meet the needs of State and local government's data must be current and detailed enough to provide the resolution needed for the environmental and urban analysis, planning, and management. In addition to currency and accuracy the data must also be of sufficient detail so that the entities utilizing this information can make intelligent decisions.

Soils

Digital soil data are available for all of Missouri. The Natural Resources Conservation Service (NRCS) and the MDNR developed the data as a cooperative effort. All digital soils meet (or soon will meet) the NCRS Soil Survey Geographic Standards (SSURGO) for 1:24,000-scale information. Thirty-three surveys currently require additional processing before being SSURGO-certified.

NRCS has also processed 28 counties as Version II SSURGO data. Version II data include attribute information in a relational database format, and are ready for use in an ArcView 3.x extension called Soil Data Viewer. Soil Data Viewer makes accessing and mapping soil interpretations and attributes easier for users. Version II data production is projected to be completed in about one year.

With first generation soil mapping completed, MNDR and NRCS have collaborated to establish six Major Land Resource Area (MLRA) project offices. MLRA Project Office staffs are evaluating the quality of existing soil surveys in their areas and establishing recommendations for second-generation mapping.

Critical Infrastructure

Critical facilities and infrastructure are human-built systems that are essential to the safety, security, health and economic well being of our modern society. These systems are vulnerable to disruption by natural disasters or human caused events. Many critical facilities are part of the system for responding to disrupting events. Examples of critical facilities and infrastructure include police and fire stations; hospitals and other medical care facilities; schools; transportation systems; energy distribution; water distribution; telecommunications.

Planning for and responding to threats to critical infrastructure, including the use of key response resources at essential facilities can be significantly enhanced through spatial representation. While a large amount of spatial data already exists to support the Homeland Security efforts in the state of Missouri, a number of key databases are missing. These data are primarily point-specific locations, or highly detailed databases.

Reference

Framework – Introduction and Guide. Federal Geographic Data Committee, 1997.