

GIS NEWS SUMMER 1996

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Digital Raster Graphics

by: Lance Clampitt

Every now and then I get the opportunity to talk about a product that is not really new to the world of geospatial data but has been given new life as technology improves and needs change. The Digital Raster Graphic produced by the USGS is one such product. A digital raster graphic (DRG) is a scanned image of a U.S. Geological Survey (USGS) topographic map. The scanned image includes all map collar information. The image inside the map neatline is georeferenced to the surface of the Earth.

At the USGS, the first step in the process is to scan a paper 7.5-minute topographic map. scanning a standard USGS quadrangle at a resolution of 500 dots per inch (dpi) results in a red-green-blue (RGB) file of up to 300 megabytes. The RGB file is converted to tagged image file format (TIFF), viewed, and the position of each of the sixteen 2.5-minute grid ticks on the image is collected. Software uses these coordinates to rectify and georeference the image to the UTM ground coordinates. The image is resampled to 250 dpi and compressed using loss less compression to reduce the size of the data set. The final result is a packbit-compressed TIFF file. The file size averages between 5 to 15 megabytes (USGS, Digital Raster Graphic fact sheet, Oct 1995).

The DRG is useful as a backdrop onto which other digital data can be overlaid. At the USGS, the DRG has shown potential for validating DLG's and for DLG data collection and revision. USGS recently used DRG's as a digital collection tool for the collection and revision of DLG data for the Bureau of Land Management, Oregon State Office. Because the DRG is georeferenced to the Earth's surface the DRG could be used as a source of control for the imagery. The DRG was also used to capture non-image categories such as boundaries, and features that could not be easily photo identified, such as windmills and wells. The DRG can help assess the completeness of digital data from other mapping agencies. It can also be used to produce "hybrid" products. These include combined DRG's and DOQ's for revising and collecting digital data, DRG's and DEM's for creating shaded-relief DRG's, and combinations of DRG, DOQ, and DLG data.

The USGS, with the help of mapping cooperators hopes to complete national DRG coverage by the year 2000. For information about Federal and non-Federal partnerships for cost-share, work-share and data exchange, contact:Lance S. Clampitt, USGS, National Mapping Division, Box 25046, MS 507, Denver, CO 80225-0046, (303) 202-4514 Email: lsclampitt@usgs.gov

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Montana and the National Mapping Program

by: Lance Clampitt

Montana is rich in a wide variety of natural resources. Conflicting demands to develop or preserve these resources result in considerable controversy over resource-management policies and decisions. For more than 100 years, the U.S. Geological Survey (USGS) has worked closely with Federal, State, and local interest to help provide the products and scientific knowledge needed for the wise management, development, and protection of the Nation's resources. Recent USGS activity in Montana includes the production of forty Digital Elevation Models for the Montana Department of Fish, Wildlife and Parks, and thirteen Digital Elevation Models for the Montana Department of Environmental Quality.

In June 1996 I was asked to represent the National Mapping Division for all mapping activities in the States of Montana and Wyoming. As a native of Colorado, I feel very fortunate to work with western States and especially enthusiastic to have the opportunity to work with the Rocky Mountain States which share many economic and environmental issues. I have spent several years in the Federal mapping sector, producing cartographic data with both the Defense Mapping Agency and the USGS.

My hopes are that in my new position I will be able to reflect on my own mapping experience to understand the needs of the customer. At the very least I would like to help the data user and manager understand USGS geospatial data and how these products can be used to solve problems and manage areas of responsibility.

The responsibility for providing credible, impartial scientific information to those charged with making public policy is central to the mission of the USGS. As the new USGS, National Mapping Representative for Montana I look forward to working with and for the people of Montana who rely on this information.

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Remote Sensing of Biomass Burning

by: Lloyd P. Queen, James R. Plummer, Steven W. Running

Biomass burning, which includes wildland fires, land clearing for shifting cultivation, deforestation, and fuel wood consumption, is an important source of many trace gases and aerosols in the atmosphere. Interest in biomass burning and the emitted compounds is rising due to the potential impact on atmospheric chemistry, global climate change, biogeochemical cycles, and regional air quality. Carbon dioxide (CO₂) has been implicated in the so-called greenhouse effect, carbon monoxide (CO) and hydrocarbons can impact the oxidative state of the atmosphere, halogenated compounds such as methyl bromide (CH₃-Br) can destroy stratospheric ozone, and aerosol particles may have a significant effect on earth's radiation budget and hydrologic cycles.

In spite of the interest in global biomass burning, methods of characterizing fires at landscape and global scales have yet to be implemented. Due to the widespread spatial and temporal occurrence of vegetation fires, satellite remote sensing offers a unique opportunity for fire investigation. Previous remote sensing approaches have concentrated on single platform data (such as NOAA-AVHRR) for fire detection, burn scar assessment, and pre- and post fire vegetation conditions. However, these studies were, for the most part, regional in nature. Since biomass burning shows a high degree of seasonality around the globe, high spatial and temporal data on fire occurrence and areal extent of burns are needed for atmospheric chemists, climate modelers, and global ecologists.

The fire modeling project in our laboratory is a cooperative research agreement between the University of

Montana Remote Sensing Program, the Numerical Terradynamic Simulation Group at the University of Montana, and the U.S. Forest Service Intermountain Fire Sciences Laboratory (IFSL) in Missoula. The project will take an integrated multi-platform approach to characterizing biomass fires. Our goal is to develop the methodologies using currently available satellites and aircraft sensors to prepare for the 1998 launch of the NASA Earth Observing System (EOS) AM-1 platform which will carry, among others, the Moderate-Resolution Imaging Spectroradiometer (MODIS) and the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER). We will use the Defense Meteorological Satellite Platform Operational Linescan System (DMSP-OLS) and NOAA Advanced Very High Resolution Radiometer (AVHRR) for fire detection, LANDSAT Thematic Mapper (TM) for burn scar assessment and regional calibration of DMSP, and the MODIS Airborne Simulator (MAS) and Airborne Visible and Infrared Imaging Spectrometer (AVIRIS) as simulations of the forthcoming EOS sensors. Additionally, the advanced terrestrial algorithms being developed for MODIS will be applied to AVHRR data for use in vegetation characterization. Models of emissions, based on extensive IFSL field campaigns, will then be applied to the remotely sensed products for robust estimations of CO, CO₂, hydrocarbon, halocarbon, and aerosol emissions. Preliminary studies will focus on historic data for methodological development of fire detection, burn scar assessments, and various vegetation product algorithms in the Pacific Northwest United States and Montana in particular. Upon completion of preliminary development, current products will be developed and distributed through the NRIS Water Information System. These products will include new fire danger indices, a new drought index, and composite images of fire occurrence. NRIS will be an important partner in this project and will serve as a data distribution center for the region and users in the state of Montana.

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Wetlands Datasets

The Montana Wetlands Council is embarking on a project to compile a directory of wetland- related datasets. Information on each dataset will be collected and organized according to the Federal Geographic Data Standards for metadata. Funds for this project are allocated to assist participating data managers in building appropriate metadata, for public access via the Internet.

Members of the Council's Data Group are soliciting participation from individuals and organizations creating, and managing datasets which identify wetland and riparian resources within Montana. Locational information can be general, or specific and detailed. The dataset may be in a GIS format, or simply text and tabular. A Data Group representative will guide and assist each participant in data entry and completion of acceptable files.

The software program "MetaMaker" produced by the US Dept. of Interior, National Biological Service, will be used for data entry. Where data managers have accessible desktop computers with MicroSoft Windows, they will be encouraged to load MetaMaker for interactive use in building their metadata files. The Council will provide diskettes with the software and User's Manual for interested participants, or it can be downloaded directly from the NBS site "http://www.emtc.nbs.gov/http_data/emtc_spatial/applications/applic_page.html". A general description of the software is found on "<http://www.nbs.gov/nbii/whatsnew/metadata.html>".

The intent of the project is to surmount initial obstacles to metadata development, and facilitate data sharing by providing dataset details in a standardized format from a central, public location. It is also an opportunity for the Council and participating individuals to learn about documenting the data they create and use, with access to knowledgeable assistants. As the Montana Wetlands Council pursues projects and programs, we will be building the foundation necessary for increased awareness of our natural resources, and for making informed decisions.

For additional information and metadata assistance contact Val Jaffe, Data Group Leader, at (406) 444-3345, or val@nriss.mt.gov, and Jeff Ryan, Montana Wetlands Council Coordinator at (406) 444-4626.

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Metadata Tools

All Federal agencies are required to provide documentation (metadata) with any GIS data that they produce. This metadata must comply with the Content Standards for Digital Geospatial Metadata, published by the Federal Geographic Data Committee (FGDC). The FGDC Metadata Standard is also becoming the standard required by many foreign, state, local, and private agencies. A description of the Metadata Standard can be obtained from the State Library (call Pam Smith at 406-444-5354), or from the FGDC's World Wide Web site at <http://www.fgdc.gov/Metadata/metahome.html>

A list of metadata tools available from the Internet follows. For future additions to the list, check out <http://www.fgdc.gov/clearinghouse/mitre/task2/tools.html>

-DOS/Windows Metadata Input Tools

-MetaMaker -- a MS Access-based tool for entering metadata

http://www.emtc.nbs.gov/http_data/emtc_spatial/applications/applic_page.html

-A WordPerfect template for entering metadata, from the National Biological Survey

<ftp://ftp.nbs.gov/pub/metadata/template.wp>

-Power Builder based application from the NOAA Strategic Environmental Assessment Division

ftp://seaserver.nos.noaa.gov/pub/other_products/sea/2_sea_95-23

-Unix Metadata Input Tools

xtme -- an X-windows based Metadata input tool from the U.S. Geological Survey

<http://geochange.er.usgs.gov/pub/tools/metadata/editor.tar.Z>

DATADICT.AML -- a tool inspired by DOCUMENT.AML, but designed from scratch to comply with the Metadata Standard <http://nris.mt.gov/nsdi/datadict/datadict.readme>

-Relational Database Implementations (database structure definition only, no input forms)

Create-table instructions for three different relational implementations of the Standard

<http://www.fgdc.gov/clearinghouse/index.html>

-WWW Metadata Verification Tool

This HTML form uses the U.S. Geological Survey metadata validation program (mp) to tell you whether or not your metadata complies with the Standard. For this to work, your metadata file must be available from a WWW or FTP server. <http://www-mel.nrlmry.navy.mil/mel-bin/meta-val>

-HTML Form for Metadata Input

-Meta Morph, from the U.S. Geological Survey

<http://webserver.cr.usgs.gov/metadata/html/metaforms.html>

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MT Groups Receive Grant For Development of National Geospatial Data Clearinghouse

A group of cooperating State, Federal, and private GIS users were recently awarded a Federal Geographic Data Committee (FGDC) Competitive Cooperative Agreements Program (CCAP) to facilitate development of the National Geospatial Data Clearinghouse (NGDC) in Montana. The purpose of the CCAP is to facilitate and foster partnerships and alliances within and among various public and private entities to assist in building the

NGDC. The project goal is to facilitate access to GIS databases in Montana by establishing multiple NGDC Internet nodes in Montana. The project is a collaborative undertaking among the Natural Resource Information System (NRIS), Montana Department of Environmental Quality; DesktopAssistance. Inc.; University of Montana School of Forestry; and the United States Forest Service Helena National Forest. NRIS will be lead agency for administering the project and for providing the specific technical expertise related to implementing an NGDC node. The other organizations will provide technical support on their systems, the staff required to assist with the installation of the software components of an NGDC node, and the staff to document data to the FGDC Metadata Standard.

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NRIS Receives URISA Award

The Montana Natural Resource Information System (NRIS) was recently awarded an Exemplary Systems in Government (ESIG) award from the Urban and Regional Information Systems Association (URISA). The award was presented at the annual URISA conference in Salt Lake City. The award is ..for international recognition of exceptional achievement in the application of information technology that has improved the delivery and quality of government service. NRIS was recognized for its efforts in establishing a node on the National Spatial Data Infrastructure (NSDI). The NRIS node allows Internet users to access documentation, graphics, and GIS databases directly from the NRIS WWW site. A significant component of the NRIS node is a Wide Area Iinformation Service (WAIS) server. The WAIS allows users to search by keyword and spatial WAIS servers with a single query. For instance, right now someone can log on to the USGS National Geospatial Data Clearinghouse server and search USGS, EPA, and NRIS data holdings with a single query. To see the multi-site search capabilities of the WAIS technology go to the USGS server at <http://h2o.er.usgs.gov/public/fgdcquery.html>. The URL for the NRIS WWW site is <http://nris.mt.gov>.

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Statewide Digital Elevation Model (DEM) Data Project

At it's annual meeting on August 8, 1996, the Montana Interagency GIS Steering Committee established as a priority the completion of the US Geological survey's (USGS) state-wide 7 ½ minute digital elevation model (DEM) database for Montana. The completion of the database will require a cooperative effort between the USGS and Montana GIS users. If you use or need the DEM data or can help with the completion effort, please contact:

Allan Cox, Natural Resource Information System, Montana State Library, 1515 E Sixth Ave., Helena, MT 59620. 406-444-5355 or Email at acox@nris.mt.gov.

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New GIS Databases Available

We invite all to browse prototype images on the NTSG homepage: <http://www.forestry.umt.edu/ntsg>.

BLM Ownership Layer

The Bureau of Land Management (BLM) has recently completed development of a generalized ownership

database for Montana. The layer is based on the 1:100,000 scale BLM ownership maps. Multiple classes of federal ownership, state ownership, and private lands are represented in the database. A companion database developed along with the ownership is a 1:100,000 scale public land survey system (PLSS) layer. Each section in the database has codes for its township, range, and section identifiers. Both layers are organized by United States Geological Survey (USGS) 100k quadrangles. BLM has requested the Montana Natural Resource Information System (NRIS) to distribute these databases for them. They can be obtained by contacting NRIS at (406) 444-5354 or by accessing the NRIS internet site at <http://nris.mt.gov/gis/gis.html> and going to the Montana Maps page.

GAP Analysis Project Vegetation Layer

The Wildlife Spatial Analysis Lab at the University of Montana has recently completed the first set of vegetation mapping in support of its GAP analysis project. The main product is a set of GIS databases that characterize existing vegetation and land cover across 26.2 million hectares (64.8 million acres) in northern Idaho and western Montana. Information are stored in raster GIS databases (ARC/INFO grids) created for 18 Landsat TM scenes covering the project area. Each of the 18 land cover databases is roughly 50 megabytes in size and is comprised of about 300,000 raster polygons or regions that are 2 ha (5 ac) or larger in size. Each region is analogous to a stand; it has a unique identifier and more than 30 attributes describing such features as lifeform, cover type, size class, and canopy closure. Also available is a detailed Final Report that includes accuracy tables for each TM scene; these will allow users to evaluate the classification accuracies for individual cover types on a scene-by-scene basis. A separate GIS layer was created to map riparian cover types in each TM scene at a 0.09 ha (0.2 ac) minimum mapping unit (MMU) that corresponds to individual 30 m² pixels. File sizes for these riparian databases are smaller because they contain fewer attributes; but they contain nearly as many regions because of their considerably smaller MMU. Attributes for both the land cover and riparian databases can be accessed, updated, and manipulated through the INFO (or ORACLE) database, or through the GRID module of ARC/INFO. Intermediate data products were provided to enable users to track steps in the classification process and to make their own modifications. Elevation and hydrographic source data for the project area were also delivered as digital files corresponding to standard USGS 1:100,000 scale quadrangles (122 quads for elevation and 107 for hydrography). The elevation data were 7.5 minute digital elevation models (DEMs) from the USGS and the Forest Service (Geometronics Service Center); hydrography data came from USGS Digital Line Graphs (1:100,000 scale). The Lab has requested the Montana Natural Resource Information System (NRIS) to distribute these databases for them. They can be obtained by contacting NRIS at (406) 444-5354. The Wildlife Spatial Analysis Lab may be contacted by accessing their WWW site at <http://www.wru.umt.edu/>.

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Adopt a School in Your Area

The school subcommittee is gearing up for the 1997 Montana GIS Users' Conference in Bozeman. The group would like to encourage you to adopt a school in your area. The idea is to work with teachers this fall to develop a GIS Project for the classroom that will dovetail with pre-existing lesson plans. The project can vary in complexity according to the age group that you are working with, and the amount of time that you can devote to a project. Last Fall, several members of the school subcommittee adopted elementary, middle school, and high school classrooms in the Missoula area. The students and/or teachers gave presentations at Public Night this Spring. For the 1997 conference, we would like to encourage the students to make presentations at Public Night. We would also like to expand the scope of the project by helping the students develop homepages of their GIS work. If you would like to adopt a school in your area for a GIS Project, the school subcommittee will provide advice and assistance about what does and does not work in the K-12 setting. If you'd like more information, contact Kris Larson at kris@nris.mt.gov or by telephone at 406-444-5691.

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First Montana GIS Scholarship Likely in 1997

The Montana GIS Users' Group endowed scholarship project is progressing on track. The plan is to establish a \$10,000 endowment at both the University of Montana and Montana State University. The endowments will allow one student at each university to be awarded a \$500 scholarship each year into perpetuity. The first endowment will be established at MSU. The Users' Group established an account for the endowments in 1995. After the conference each year, \$10,000 is kept in the main account as seed money for the conference and other Users' Group services. Any additional money is transferred to the Scholarship account. The initial balance in the Scholarship account was almost \$2500. At the 1996 GIS Conference, the school subcommittee worked hard to raise money in addition to the money acquired through registration fees. With many thanks to all of you who bought T-shirts and/or raffle tickets, the school subcommittee happily reports that the balance in the account is now close to \$8000. Based on past years' experience, it seems likely that we will have enough money to establish the first scholarship after the 1997 conference. How apropos that the conference will be held in Bozeman in 1997!

The school subcommittee is currently working with MSU to determine the requirements for the scholarship recipient. If you have ideas or comments about the direction of the scholarship, contact Jackie Magnant by phone at 406-994-6921 or via email at [jackie@guava.giac.montana.edu](mailto:atjackie@guava.giac.montana.edu)

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Ninth Annual Montana GIS Conference to be Held in Bozeman

The Montana GIS Users' Group held it's first meeting to plan the 1997 Montana GIS Conference in Bozeman. The conference dates have been set for April 28 - 30 at the Holiday Inn. If you would like to be involved in planning the 1997 conference or if you have any suggestions or comments for the coming year's conference, please contact Jackie Magnant, Montana State University - Bozeman, via email at jackie@guava.giac.montana.edu or by phone at 406-994-6921.

Up-to-date conference information will be available via the internet at <http://sun1.giac.montana.edu/mtconf97.html>

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