



imagi NEWS

GIS and Emergency Management

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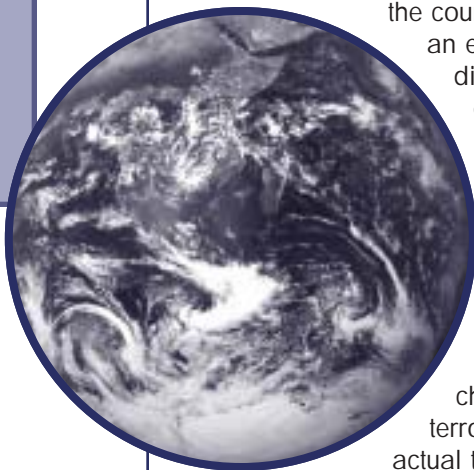
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INTRODUCTION

The purpose of Emergency Management in most counties is to develop and implement an emergency management system that protects the citizens of the county from the effects of an emergency and/or disaster. An

emergency/disaster may be a result of natural causes related to weather or geophysical phenomena, or of human-induced causes such as industrial accidents, chemical spills, or terrorism. Whatever the actual trigger of the

emergency, the role of spatial information is crucial in responding and managing such events. Where did the event occur? Which areas have been affected adversely by the event, and what is the demography of the area? Where are resources located to respond to the event? Where are some other facilities that may be affected by this event? Are there any schools, HAZMAT sites, nursing homes or other locations with special needs in the vicinity? The list of questions can go on and on. It is perhaps for this reason, emergency and disaster management is considered the most spatially-oriented of all management sciences. Many recent adverse events have demonstrated the use of spatial

technologies in the management of such events. The World Trade Center bombing, Nisqually Earthquake, Hurricane Andrew, Hurricane Floyd, Northridge Earthquake, Oklahoma City bombing and many other events in the recent past have used GIS and spatial technologies in responding to the need for protecting citizens. The extent to which such technologies were used in the above disasters depended upon the level of preparedness, the availability and reliability of various datasets, and the level of communication between many agencies that were either producers or consumers of spatial information or both.

DISASTER/EMERGENCY MANAGEMENT AND GIS

Management of natural disasters constitutes a complex process that can be simplified into four different stages - preparedness, response, recovery, and mitigation (Fig. 1). These four stages do not occur in a linear pattern but are cyclical in nature with actions that overlap. It is important to understand the difficulty in defining start and end points for intervention. Intervention can be at any point in the disaster management cycle depending upon the situation and the preparedness of the responding agency. GIS can be used and may be critical in each of these four phases. Some applications of GIS and spatial technologies of interest to county emergency management agencies are discussed here.

Who's Doing What in GIS and Spatial Technology?

by Christopher Blough



A SUMMARY OF THE CHARLEVOIX COUNTY GIS PROGRAM

WHO: Situated in northwest lower Michigan, Charlevoix County is renowned for its impressive water resources with over 138 miles (222 km) of Great Lakes shoreline (including Beaver Island and its surrounding islands) and approximately 40 square miles (104 km²) of inland lakes including its largest, Lake Charlevoix.

POPULATION: 26,090 (2000 Census)

GEOGRAPHIC COVERAGE: The County's land area is 416.85 square miles (1079.64 km²) ranking as Michigan's third smallest county behind Arenac and Benzie, according to the Michigan Information Center.

NUMBER OF STAFF: 1 – GIS Coordinator,
1 – Equalization GIS Technician, 1- Planning Director

GIS DATA DEVELOPMENT

Charlevoix County began developing the County GIS within its Equalization and Planning Departments. The Planning Department began using the DOS version of C-Map initially for land use and soil analysis and to create maps supplementing planning projects, studies, and grant related programs. Later the Planning Department, along with the Equalization Department, switched to MapInfo as its primary, Windows-based desktop GIS software. Planning has been using MapInfo to conduct the land use inventory and related analysis, while regularly using the County's 1997 digital orthophotography to supplement its research. In 1999, the Department was awarded a 319 Watershed Grant from the MDEQ providing funding to update the 1978 land use/cover inventory. The new, 1997 land use/cover update was performed by staff at the Central Michigan University GIS Center and involved the registration of land use polygons to the 1997 orthoimagery. The Center also scanned the original 1978, 1:15840 scale, color-infrared photos the County purchased from the MDNR. The ability to visually compare land use and land cover change during the twenty-year span will make these extremely valuable for planning studies. The final land use change statistics between 1978-1997 are being tabulated and will be used to support the planning activities of the County Planning Commission and cities, villages, and townships (CVTs).

The conversion of the County's cadastral information began during the mid 1990s when the Equalization Department began converting its 1:1200 scale tax maps in-house with a tablet digitizer. Professional GIS vendors were selected to convert legacy, digital data into MapInfo and provide scanning services to convert the original tax maps into parcel polygons for the City of East Jordan and townships on Beaver Island.

At the beginning of this year, the Department completed the conversion of all unincorporated areas in Charlevoix County (26,323 parcels according to the 2001 Equalization Report), registering the parcel base to MDNR MIRIS section corners.

The cities of Boyne City, Charlevoix, and East Jordan are the next priorities for 2002 as they are seamed together with the unincorporated areas. Both the 1997 orthoimagery and Charlevoix-Cheboygan-Emmet (CCE) 911 GPS road layer will be used to assist in the edge matching of the municipal and township boundaries.

WHO'S DOING WHAT continued on page 5

PREPAREDNESS

Emergency preparedness activities are necessary to the extent that mitigation measures have not, or cannot, prevent an emergency and/or disaster. In preparedness activities, an emergency management group develops plans in coordination with other participating agencies to save lives and minimize disaster damage. Preparedness measures such as siren installation and ongoing testing, stockpiling resources, performing training exercises, and mobilizing emergency response personnel, enhance disaster response operations. Siren testing is one use of GIS in preparedness. Emergency management can use GIS to determine the siren coverage in the county. Can everyone hear the siren system? Which sirens are in need of repair? Another common use of GIS is to track the location of hazardous materials, such as those determined through the Superfund Amendment and Reauthorization Act (commonly called SARA) Title III compliance activities. These activities would need to be coordinated with local fire departments to assure that information is current and available to all first responders in an emergency. A support database for hazardous materials is the Environmental Protection Agency’s CAMEO database, which contains over 4,000 hazardous chemicals, 50,000 synonyms, and product trade names. Each one is linked to chemical-specific information on fire and explosive hazards, health hazards, firefighting techniques, cleanup procedures, and protective clothing. The CAMEO database also contains basic information on facilities that store chemicals, on the inventory of chemicals at the facility (Tier II) and on emergency planning resources.

Weather data (weather wire and radar) is a vital component of emergency management. Some counties supplement this information with “Storm Spotters” to help isolate the location of potential storms and monitor their path across the County. Weather data and monitoring should include the following components:

- Current weather at point locations, updated every six minutes.
- Current weather for a custom region, updated every five minutes.
- Current weather analysis grids, updated every hour.
- Current national weather graphics, update frequencies vary.

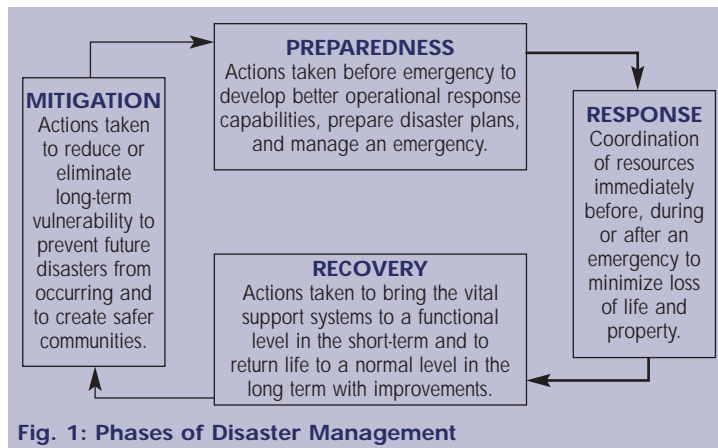


Fig. 1: Phases of Disaster Management

- Forecast weather at point locations, update frequencies vary.
- Forecast weather grids, update frequencies vary.
- Forecast weather graphics, update frequencies vary.

Weather information can be integrated with other emergency management data layers and provided to a larger user community via GIS technology.

Preparedness also includes the creation of data about critical

locations such as schools, hospitals, fire and police stations, emergency management centers, emergency shelters, day cares, nursing homes, etc. Integration of these data with other base layers such as parcels with property record data, orthophotos, street centerlines with address ranges, topography, infrastructure and privately owned utilities data such as natural gas, electricity and communication networks, is vital for efficient response. Anticipating what will be needed and when, is an important use of GIS in an emergency response situation. It is always easier to have tested this information ahead of time. Some counties may even use GIS simulations of emergencies to test their data and procedures. The preparedness stage is also a good time to build data sharing partnerships between various agencies and particularly the private sector utility companies that have a lot of critical data. Such data may not be easily available due to proprietary or other licensing restrictions.

RESPONSE

Response activities occur immediately before, during, and after the onset of the emergency with varying degrees of response time based on the type of emergency/disaster. These activities are designed to provide immediate emergency assistance to victims. They also seek to stabilize the situation, reduce the probability of secondary damage and speed recovery operations. Primary responsibility for an emergency response rests with the local government in which the situation occurs but if the situation requires special resources and/or develops beyond their control, assistance from county, state, or federal emergency management agencies may be requested. In most cases county emergency response means activation of the emergency operations center (EOC). These centers usually have to be initiated by a county executive or equivalent. They are only in operation during an emergency but are staffed by

EMERGENCY MANAGEMENT continued from page 3

emergency management departments. In most cases the emergency operations center includes ranking elected officials and department heads of critical agencies. During the September 11th emergency in New York City, the Mayor was summoned to the EOC; incidentally the EOC was located within one of the World Trade Center buildings and had to be redeployed. The redeployment of the EOC and the use of GIS in the aftermath of the attack has been the subject of many articles in the GIS press (ArcNews, Winter 2001; Barnes, 2001).

GIS is a critical tool for the emergency operations center. This is the place where the success or failure of the GIS is often tested. It is critical to have the necessary datasets in place and readily available before the emergency. In recent months many counties have been evaluating what datasets they need and where they should be located so they can be accessed and deployed in a hurry. The GIS design for emergency operations has to focus on speed of access and clarity of presentation. For example, it might be more effective to have school locations as points with symbology rather than trying to draw the building outlines, parcel boundaries or floor plans, at least as a first inquiry.

Providing access to the GIS data sets will greatly enhance emergency management's ability to respond to an emergency and/or disaster. Furthermore, integration of these GIS datasets will increase emergency response times, promote effective decision-making, and improve damage assessment calculations.

RECOVERY

Recovery activities are necessary to return all systems to normal operations or better. They include two sets of activities. Short-term recovery activities are typically related to search and rescue, provision of immediate health and safety needs, restoration of vital life-support systems to minimum operating standards, cleanup, provision of temporary housing, and access to food and water. Long-term recovery activities are typically related to economic, social, and physical recovery, restoration of life to normalcy or improved levels, community planning and applying for redevelopment loans, and legal assistance. During recovery efforts, the emergency management group works with municipalities and other units of government (state and federal) to manage logistics, maintain communication and alleviate any problems that may arise. Most emergencies and disasters also present windows of opportunities to make changes in status quo, learn from mistakes of the past, and rally for additional funds for future mitigation and better preparedness.

GIS assists emergency managers both in the short-term and long-term recovery phase – it assists in search and rescue efforts, damage assessment, track changes and recovery, and compare pre and post-disaster conditions. Furthermore, “pretty” maps along with simple reports can go a long way to not only assist the front line responders but also to inform decision-makers and elected officials about the socio-political and economic impacts of the emergency to their constituents. In fact such maps are also extremely useful for emergency agencies and assist with grant applications and fiscal impact assessment reports.

MITIGATION

The term mitigation refers to the reduction of vulnerability through adjustments such as land-use control, building regulations, or other non-structural measures. The disaster mitigation phase is difficult to define as it incorporates tasks from the long-term recovery phase and provides the starting point of the disaster preparedness phase. In some cases, Emergency Management will pursue grant efforts in support of emergency and/or disaster mitigation. Spatial information, analysis and GIS-based modeling can also provide Emergency Management with decision support on what mitigation measures to pursue where and how to prioritize the use of limited resources in order to get the greatest bang for the buck!

A common lesson learned from most disasters and emergency events is that spatial technologies provided critical information for response, recovery and mitigation. In fact, in many cases such events have triggered financial investment for spatial data acquisition and GIS development and the formalization of policies and procedures for management and sharing of data in adverse situations. However, no agency can afford to wait for an emergency to happen to put together an emergency management plan that incorporates use of spatial data using advanced technologies. To be proactive, emphasis has to be placed on preparedness and mitigation. Every agency should assess the needs for protecting its citizens. Now. Every agency has to do something to create a safer world for its constituents. Now. Every effort, even the seemingly smallest tasks, constitutes steps in the right direction and can prevent the loss of life and property in an unforeseen adverse situation.

REFERENCES:

- ArcNews. Winter 2001. New York City – Creating a Disaster Management GIS on the Fly.
- Barnes, Scottie. 2001. United in Purpose: Spatial Help in the Aftermath. In Geospatial Solutions. November 2001.

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Another potential resource may be derived from the County's remonumentation committee. The committee members are considering the collection of GPS coordinates for remonumented section corners this year as well.

GIS PLANNING & IMPLEMENTATION

Through the Northwest Michigan Council of Governments, the County received an MDEQ Coastal Management Program grant to conduct a countywide, GIS needs assessment as part of a strategic planning process. After involving many potential stakeholders, the County Board of Commissioners adopted the GIS Strategic Plan in 1998.

The Plan outlined several immediate priorities. The first was to utilize one, address-geocoded road layer as the primary resource for obtaining consistent addressing information for any County department requiring such information (emergency/police response within all local units, address assignment-Equalization Department, qualified voter file maintenance - County Clerk, address numbering-Road Commission, address confirmation-Building Department). The second was to maximize the dissemination of County resources resulting from GIS analysis to County departments, County affiliated agencies, and County CVTs, enabling them to access the same information for analysis and reporting. In early January, the County GIS Implementation Committee recommended the Board of Commissioners adopt an intergovernmental agreement allowing data owned by the County to be made available with minimal fees to participating members. In return, data owned by the members will be exchanged and shared with the County. In late February, following review by the County's legal council, the Board of Commissioners approved the intergovernmental agreement.

The final, immediate priority involves providing the Building Inspection Department, CCE Emergency 911, Planning

Department, Register of Deeds, and Road Commission access to the property ownership data layers maintained by the Equalization Department. The County's new data server and improved network is a substantial step forward and will enable 13 departments access to this information by Spring of 2002.

While departments may have access to GIS information, training and exposure to GIS applications will be the responsibility of the GIS Coordinator. The Coordinator position was established in August of 2001, and its incumbent will work interdepartmentally with all County departments to phase new GIS resources and applications into use as outlined within the GIS Strategic Plan. In order to further expose GIS to County staff, the County received a grant from ESRI and the National Association of Counties. The grant will provide both ESRI software and training for County staff to enhance the benefits of using GIS resources.

The underlying goal of the Charlevoix County GIS program is to improve public service delivery and enhance County staff responsiveness to citizen needs and inquiries. The GIS Coordinator's role in this process will be to identify and expose as many stakeholders and beneficiaries of GIS-related information as possible, therefore promoting the use and understanding of these resources. The public's return on investment within GIS related programs is maximized because the resources are introduced, maintained, and enhanced with feedback from those using the information.

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IMAGIN Conference 2002: Geography on the Move

Conference Registration Deadline – via the IMAGIN office in Southfield office is Thursday, April 18th. On Site registration will be available at Grand Traverse Resort at the registration desk located in the Prefunction area.

Book Signing – Miles Harvey, author the *The Island of Lost Maps*, and Tuesday Dinner speaker, will be available for a book signing immediately following the Tuesday Dinner and during the Wednesday Continental Breakfast.

Job Board – Please bring employment opportunities to post on the Job Board, located in the rear of the Exhibit Hall. The IMAGIN website, www.imagin.org, also offers a section to post employment and internship opportunities.

Special Offerings – Grand Traverse Resort & Spa will offer discounts to all Conference participants for their three golf courses plus the on site Spa. Details will be included with your Conference confirmation letter.

From the Events Committee . . .



Hopefully by now you have heard that the Eleventh Annual IMAGIN Conference will be April 29th to May 1st at the Grand Traverse Resort. You haven't?! Well let me tell you what you'll be missing if you don't go...

For starters, there is a great line-up of workshops! If you use Michigan Information Center's (MIC) Framework Data, you don't want to skip their "Using Census Data with the Michigan Geographic Framework" workshop. Learn how to pull data from MIC's web site and integrate it into your GIS! Is your organization interested in getting a GPS? If so, consider taking one or both the workshops showcasing Leica and Trimble GPS units. If you missed the Metadata workshop sponsored by IMAGIN before, here's your last chance to see it again! Dave Frey will be presenting a shortened version of the workshop. Starting to use ArcIMS? Learn the basics from Plansight representative Suzanne Fliege. The Institute for Community and Regional Development will also be giving a workshop on the "ins and outs" of grant writing and how to locate grant sources.

To follow-up on our workshops we have organized over 65 presentations and discussions ranging from Public Works Asset Management to Photogrammetry, from Transportation Planning to Homeland Security. We have more informative and interesting presentations lined up this year than we have had any previous year! We have made several changes to the conference brochure to ensure that everyone gets what they expect out of the presentations.

Monday Night is Casino Night for IMAGIN Conference attendees! Shuttles from the resort to the casino will run all night! Grand Traverse Resort is also including Spa and Golf Center discounts. So if you have ever wanted to take on the The Bear, The Wolverine or the Spruce Run, now is your chance! Don't forget to follow up a good round of golf with a massage from the Spa!

All ESRI users will want to catch the User Group Meeting Monday night from 6:00 to 9:00 pm! Chad Anderson and Angela Zazula, Michigan ESRI representatives, are hosting the meeting this year.

Monday promises to be a busy day with our workshops and presentations. Back this year is the Student Paper Competition, once again graciously sponsored by Camp Dresser and McKee! Last year's competition brought four new faces to the IMAGIN membership. This year, since the word has gotten out, we are expecting tougher competition for our finalists. Be sure to attend their sessions on Monday in the Mackinac A Conference Room!

Finally, we have two exceptional guest speakers lined up for Tuesday Lunch and Dinner. Robert LaMacchia from the U.S. Census Bureau will speak at the Tuesday lunch. His presentation covers the recent census and the Bureau's efforts to modernize its MAF/TIGER files to update the quality of the "framework" spatial data. Miles Harvey will follow Tuesday night at dinner to discuss his book, *The Island of Lost Maps, A true Story of Cartographic Crime*. If you enjoy his talk, be sure to stick around for the book signing Tuesday night!

This year we are also extending a warm thank you to all our exhibitors who come year after year and to our new exhibitors who are joining us for the first time. We are honoring all exhibitors with a special, exhibitor only, winery tour and tasting at the Ciccone Vineyards on Sunday night before the start of the conference.

All in all it will be a great conference this year! We really look forward to seeing you there and enjoying the experience with you! If you have any questions about exhibiting or registering, please contact our Executive Director, Tracey Breen.

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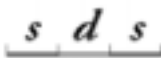
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