Information Technology & GIS employment during an Emergency Event
By Al Hill

Abstract

Tools and techniques that help mitigate the effects of a disaster and facilitate rapid and effective response can be of tremendous value--and GIS provides local governments with that tool set. If stocked in advance with appropriate data and staffed with people who are creative and flexible in thinking and who have considered its employment, a GIS can make a jurisdiction much better prepared to handle any emergency event. This presentation will discuss what tools and techniques Seminole County has effectively put in place and used during recent EOC activities to better serve both internal staff as well as our taxpayers. Using these techniques we were able to manage and mitigate the effects of three hurricane events suffered by the County over a six-week period in 2004.

Lord Baden Powell the originator of the Scouting Program when asked what the Boy Scout motto "Be Prepared" meant said simply, "Be prepared for anything". An Emergency Operations Center and the staff that man it also, literally, must be prepared for anything, from a terrorist event to any of a number of types of natural disaster. Tools that help mitigate the affects and facilitate rapid and effective response can be of tremendous value and a geographic information system (GIS) provides governments that tool set. A GIS, if stocked in advance with appropriate data and staffed with people who are creative and flexible in thinking and who have carefully considered its employment, can make a jurisdiction much better prepared to handle an emergency event. Simply put, a GIS combines layers of information about a jurisdiction to give you a better understanding of the potential interactions of a variety of elements. What layers of information you combine depends on your purpose - finding the best location for a disaster recovery center or a shelter, analyzing storm damage and its affect on the power grid, viewing data to detect damage patterns, and so on.

Seminole County is located in Central Florida and comprises approximately 370 square miles with a population of 395,000. The eastern third is primarily rural while the western two-thirds is urban. The County has seven incorporated municipalities. The Geographic Information Services Group is part of the Programming and Applications Team (PAT) in Information Services, a Division under the Information Technology Department. The PAT consists of GIS staff, web developers, database programmers and the County Imaging staff working as an integrated team. This presentation will discuss what tools Seminole County's Programming and Applications Team has effectively put in place and extensively used during several EOC activations in 2004. These tools and processes allowed us to serve not only internal staff, but local, regional, and State governmental organizations as well as our taxpayers to mitigate the effects of three back to back hurricane events suffered by Central Florida.

One of the critical infrastructures in place is the County's extensive fiber network. Managed and primarily maintained by Information Technologies and comprising over 5000 strand miles, this network is employed for our Integrated Traffic Management system as well as County data and voice communications. This network connects County administrative facilities, our seven municipality's police departments, fire stations and city halls, all our high schools and many of our other public schools, and all three of our Community College campuses. This means that access to the 200 layers of geographically referenced data maintained in our central GIS library is available anywhere on the County's fiber network. This data can be employed in conjunction with data scanned into our enterprise Onbase Imaging System or a variety of engineering and other graphic data such as photos, floor plans, and several year sets of aerial photography as well as external databases on a number of County supported platforms. All these information sources were available for use and integration during the 2004 hurricane season.

Effective determination on what data was required for collection and storage has come from a combination of extensive needs assessments conducted over the years, common sense, and collected GIS staff experience. The data is maintained on a regular schedule with many layers going through their annual quality assurance process in the weeks immediately preceding hurricane season. School and shelter floor plans, hotel motel data, road and bridge information, equipment staging locations, critical facilities, etc., all are reviewed and signed off on by appropriate authorities within our organization.

GIS has been employed by Seminole County since 1995 and has been used for all aspects of emergency management preparedness including tactical preparation & planning, mitigation, response, and recovery efforts. GIS is used to identify and collect information on obvious hazards (chemical storage and flood zones for example) as well as evaluate less obvious hazards such as location or access to critical resources (medical stocks, water and food supplies), critical infrastructure (utilities, waterlines, etc.), and other potential hazards or targets. The hazard data can be compared to other mapped data (population density, streets, pipelines, power lines, etc.) to develop a risk assessment which in turn is used for pre-event planning

Prior to the 2004 hurricane season an EOC training exercise was conducted by emergency operations staff. GIS is typically involved in these exercises because we are used to generate the situation maps depicting "emergency events" used as part of the tactical presentation to ESF (Emergency Support Function) responders. The year to year turnover in staff means that ESF responders may be new to the process and policies and procedures are constantly being reviewed. Requests for technical support from the ESFs during this particular exercise indicated a general lack of understanding of what resources and information were available to them through GIS. As a result, GIS staff conducted a separate training exercise for ESF responders to introduce them to what data was available and how to access it and use it directly at their workstation in the Emergency Operations Center. Over 30 workstations in the EOC have direct access

to GIS software with a Continuity of Operations (COOP) ArcView application. Also presented were the methods available for submission of requests to GIS staff for data analysis through existing EM2000 messaging software. This training and question and answer session also allowed GIS staff to determine not only what layers of data might be required (that we did not currently have) but also specifically what attributes were needed by the various ESF staffs participating in this training to enable them to accomplish their missions more effectively. This gave us the benefit of additional time before hurricane season started to collect, prepare, and document and disseminate the requested information. It also helped us hone our standard operating procedures documentation in regards to emergency preparedness based on the current EOC staffing needs.

The GIS staff has in place an extensive SOP for emergency operations to be initiated upon notification of an event. This includes a range of activities from what to pack in the "hurricane box" to generating a minimum of 30 copies of our GIS Data CDs (comprising almost the entire library in shape file format), as well as CDs of our latest aerial photography. Copies of these CDs are distributed to each Constitutional Office and the Planning Departments of all our member municipalities. This ensures not only survivability of the data throughout the organization, but provides for all local jurisdictions and agencies to be working off the same datasets should communications or our network fail. Further, these CDs provide external agencies, FEMA the Red Cross, etc., with working copies of our data for their own purposes. These CDs include copies of ArcExplorer, ESRI's free GIS viewing software along with extensive documentation. We also immediately begin plotting copies of our standard Emergency Management Planning maps for preplanned distribution as well as to build an immediately available stock for external agencies that respond into the County. This E-size county wide map shows over 30 critical layers of data of interest to responders and relief agencies. Also produced is an up to date copy of our County Street Map Book showing all the latest road additions, municipality boundary information, signals, schools and shelters, and governmental facilities locations. This 11x17, 1"=2000' map book, a convenient size for use in vehicles, is then color reproduced in bulk for distribution as needed. An up to date copy of all critical datasets and imagery is also loaded via the network into all Building Inspector field vehicles' laptops (these are the crews responsible along with Property Appraisal staff for building damage assessment data collection and reporting).

Over the course of the 2004 hurricane season, ESF staffs requested hundreds of hard copy map products as well as requesting dozens of separate analysis tasks be conducted. These ranged from discrete tasks such as "provide a database of owners and a map showing locations of parking lots greater than 5 acres for staging and service area use in the eastern third of the County", to slightly more amorphous ones requiring integration and analysis of a variety of data such as "can you show population values for given flood zones, potential shelter or service locations nearby and provide driving directions to them? Many of these led to follow on questions or tasks - "can we use this in conjunction with known road flooding to help us route fuel trucks to our generators?" GIS assisted Public Safety planners in answering many basic questions - Where should first responder teams be staged to support incident operations? To provide site

security? What are the best potential evacuation routes given these road closures? Where are my medical and public health assets? Will the available open road networks handle the evacuation or rescue traffic to/from this area? What critical assets have I lost? Which facilities have power company priority? Where can I stage assets and supplies arriving from outside my jurisdiction?

One advantage of responding to real events is that much of what is accomplished, or data that is collected can be reused for the next event, saving time and effort. For instance, locations of facilities with permanent generators, identified during the first storm (Hurricane Charlie), were available subsequently for use. Some needs did catch us by surprise, especially during that first storm, such as the need to track traffic signal status and maintenance operations. We had signal locations as a layer but had not previously considered tracking them by type (mast arm or wire) and status (functioning, out-no power, out-damaged) for instance. This one layer drove a surprising number of processes down stream. By the third active hurricane event we were very well prepared!

Data marketing and documentation to ensure all were clear on just what was available and could be produced, and in what timeframe, also became very important to prevent redundant requests or redundant product creation based on the multiple shifts working. Preplanning and pre-plotting of "standard products" for distribution also saved a great deal of time as events unfolded. Extensive use of softcopy (all digital) map products also proved a tremendous value, especially given the additional need to communicate via email, the web and our government television channel, as well as via local commercial media. The immediate recovery efforts of County staff during and immediately after the storms were visually displayed in the EOC and quickly updated as circumstances changed. This visual status map was also available for access and could be viewed from remote locations by critical decision makers not present in the EOC. This was particularly helpful given the multiple efforts ongoing at different locations and the need to integrate efforts between County and City resources.

Because senior Information Technology Department and Division management was actively employed in the EOC itself, a very independent and democratic management style for County IT staff ensued. While each staff member was tasked with accomplishing a myriad of jobs, staff as a whole were allowed and encouraged to recognize or anticipate needs of the organization and do what was required to accomplish these tasks in a timely fashion. Each member was actively encouraged to identify methods where processes could be streamlined and integrated and to utilize technology whenever possible to improve efficiency. As a result, a number of dramatic improvements to the way business was handled occurred over the ensuing three hurricanes. These included: integration of "special needs" databases from four separate agencies into a combined product with one custodian; employment and integration of an occupational license database from our taxing authority for use by Public Safety; improved access and employment of our Dialogic reverse calling system; online access to plats and other data for field use; integration of information reporting between the Customer Service call center (our Citizen's Information Line), the web, SGTV and the media; live E911 call reporting made available to the public via the web; and a field

damage assessment collection tool initiated by County IT programming staff. Building damage assessment data was a huge bottleneck.

What started as a simple spreadsheet application for Charlie blossomed to include remote data collection and report submittal for our member municipalities and direct digital field data collection tools running on laptops in our damage assessment crew's trucks. This application was available for download via the web and in place when County and city field crews were ready to be dispatched for building damage assessment duties for the second and third storms and greatly enhanced our data collection capabilities.

All the lessons learned, relevant technologic add-ons and data sets employed have been distributed to our seven member municipalities and almost all are in some form of daily use. All will be incorporated into future training endeavors and event responses. This openness has promulgated an environment encouraging and allowing all our governmental entities to trade data resources at need in real time. It has also shown managers at all levels the value of technology training and the opportunities for efficiencies when these resources are standardized and available to staff.

The ability to respond affectively and in a timely fashion to events is critical to the safety of our taxpayers. The need to communicate conveniently in a clear, concise, and accurate manner a consistent message across the organization and to the public is also critical and was greatly enhanced by using a variety of technologies to integrate data, voice, and media communications, as well as map and database resources. Seminole County was very lucky, and we know that, but we also feel we were prepared for, as Baden Powell once put it, "anything".

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