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LAND INFORMATION *Bulletin*

from the National Consortium for Rural Geospatial InnovationS
Great Lakes, University of Wisconsin–Madison

MANAGING A DISASTER

Burnett County's Land Information System Supports Emergency Management Tasks After Tornado

Disasters, man-induced or natural, create chaos. When a tornado struck Burnett County in northern Wisconsin, their automated land information system (BLIS) helped emergency workers and county officials gain quick access to important land records. That meant disas - ter-mitigation funds for home reconstruction and repair, debris removal, and logistical man - agement during the crisis could be delivered rapidly. This bulletin highlights the role of the BLIS in the preparation, response, and recovery phases of the emergency.

As night descended on the small, northwestern Wisconsin village of Siren, many people were aware of an approaching storm front. But no one was prepared for what they would soon encounter.

At 8:06 p.m. on June 18, 2001, a warm mass of air collided with the cool air off the Great Lakes and spawned a cone-shaped tornado in a field between a dairy farm and a Baptist cemetery. It quickly grew into a geometric wedge traveling due east at 40 miles per hour. At 8:20 p.m. the tornado, classified F3 on the Fujita scale, slammed into Siren with winds reaching over 200 mph.

Meteorologists say the tornado was unusual in its size and duration for that region of the state. It lasted an hour, stretched a half-mile wide, and ripped a 41-mile swath through Burnett and Washburn Counties. A satellite photo showed a straight white line, as though a giant lawn mower had swept through the forested counties. The tornado left three dead, 17 injured, and $17 million in property and environmental damages.

A Foundation of Preparedness

Most of us can't imagine a natural disaster of this magnitude. But if anything good can be gleaned from such devastation, it was the way people pulled together in facing a near-cat- astrophic emergency. And underlying the spirit of community volunteerism was a founda- tion of emergency preparedness that Burnett County had been laying for several years.

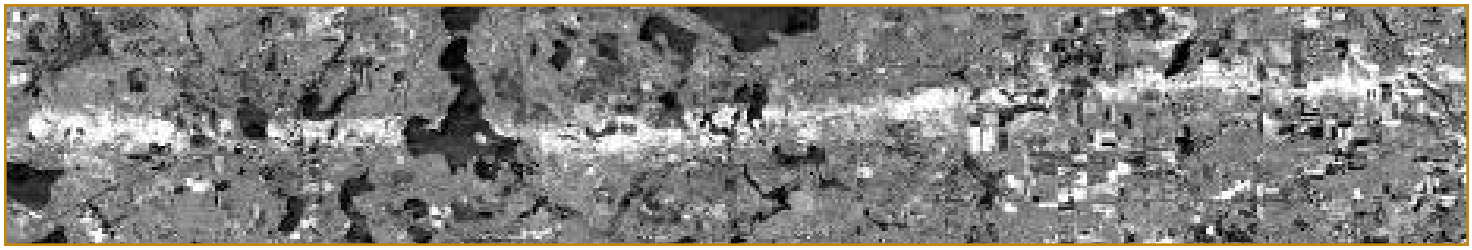
Numbers tell the story:

Impacts from the Tornado

41 miles	Path of destruction
3	Deaths
17	Injuries
205	Houses destroyed
252	Businesses destroyed
352	Homes, businesses, farms damaged
$17 million	Property damages
$7 million	Debris removal
15,000	Volunteers
110,000	Meals served
$17 million	Clean up, aid, and restitution

RIGHT (background):
An F3 tornado rumbles along Highway 70 outside of Siren, Wisconsin on June 18, 2001.

BELOW RIGHT:
Three scenes of destruction in the wake of the tornado. (Burnett County photos)



A comparative statistical analysis of the change in land reflectance between two Landsat-7 satellite images—one on May 18, 2001 and the other on June 19, 2001—shows the change in land conditions associated with the June 18, 2001 tornado. The bright path of greatest destruction shows a change in land reflectance. This image shows an enlarged view of the tornado's path centered on Clam Lake, just east of Siren. (Image courtesy USGS EROS Data Center with processing by Environmental Remote Sensing Center, University of Wisconsin-Madison)

Although tornados are uncommon in northern Wisconsin's lake country, the county's Emergency Management Services (EMS) had held numerous planning sessions for various natural disasters—tornados, ice storms, blizzards, and forest fires, to name a few. With assistance from the Wisconsin Department of Natural Resources'(WDNR) Fire and Emergency Management Unit (FEMU), county officials conducted mock emergency-mitigation and preparedness drills.

At the heart of the preparation and drills was the Burnett County land information system (BLIS). As in other Wisconsin counties, Burnett was systematically modernizing and automating county land-records systems as guided by the Wisconsin Land Information Program (WLIP). By the time the tornado struck in 2001, nearly $2 million—a significant portion generated from the WLIP— had been invested in re-monumentation, parcel mapping, orthophotography, street addressing, and for staff.

Burnett County emergency staff review information in the tornado's aftermath.

The Emergency Management Process

Burnett County's Land Information Office and Emergency Management Office made extensive use of geospatial information to both prepare for and respond to the disaster. They worked closely with the WDNR's Fire and Emergency Management Unit to effectively manage the crisis. Three phases outline the overall strategy.

Preparedness

In this phase, county personnel performed on-site testing of coordinate system compatibility, and became familiar with FEMU's grid and zone response system. In turn, the FEMU team became familiar with Burnett's LIS, and staff from both entities learned about each other's technical capabilities. They learned to work as a team.

Response

Immediately following the tornado, emergency personnel conducted an on-site damage inventory using BLIS-derived road and address maps. These maps helped identify early casualties. Establishing the geographic extent of the tornado's destructive path was another early task. The county obtained positional coordinates from the U.S. Department of Defense's global positioning satellite system (GPS). The WDNR emergency personnel created a digital boundary of the tornado's path; on-line access to Landsat satellite images helped to further delineate the tornado's path (see figure above). A map of addresses, roads, and property parcel boundaries helped identify home and property owners within the tornado's destructive boundary.

Efficiently and effectively managing 15,000 volunteers was a huge logistical challenge. A large-scale wall map helped organize volunteers, staff, and charitable organizations. Township-based maps were provided to volunteers as they were assigned tasks in stricken areas. Support maps were created on the fly—the automated system was easy to use and much faster than traditional mapping methods.

Recovery

One issue needing prompt attention was the zoning puzzle left by the destruction of many of Siren's buildings and businesses. *Who owned what and where? Should destroyed buildings be rebuilt on site or relocated? If so, where?* These questions did not have ready answers, yet answering such questions was a critical first step for planning and reconstructing the community. The BLIS promptly provided accurate property-parcel description boundaries and zoning status enabling the village to begin reconstructing the business community's infrastructure.

Another geospatial technology—high-quality, large-scale (1:9600) color orthoimagery—was incorporated into the mix.

This table summarizes how Burnett County's Land Information System (BLIS) provided support for the preparation, response, and recovery efforts facing the county before and after the 2001 tornado. The benefits derived from the BLIS are measured in terms of improved efficiency, effectiveness, and equity when serving the county's goals and its citizens.

Selected Benefits from using the Burnett County Land Information System	Efficiency				Effectiveness		Equity		
	Eliminate/ Reduce Current Cost	Avoid Future Costs	Faster	Easier	Provide Better Service	Provide New Service	Equal/ Improved Access	Equal Treat-ment	Altered Decision Making
PREPAREDNESS ACTIVITIES									
• In 1999-2000, Burnett County tested fire-emergency response plan using BLIS data.			✓		✓	✓			
• Wisconsin Department of Natural Resources (WDNR) tested access to BLIS on-line automated data to ensuresystem compatibility and eliminate bugs:									
- Coordinate system compatibility resolved						✓			
- Tested WDNR grid and zone response system					✓				
- WDNR learned about Burnett County's land information data sets	✓					✓			
- WDNR and BLIS staff learn about each other's technical capabilities					✓	✓			
RESPONSIVENESS ACTIVITIES									
• First evening (June 18, 2001) WDNR established damage assessment and GRID-incorporated addresses for initial assessment and location of casualties. Repeated the following morning, June 19.			✓	✓				✓	
• GPS receivers used to collect coordinates along roads to help establish boundaries.			✓	✓	✓	✓			
• WDNR aerial surveillance captured tornado's path and damage via digital camera. Digital index created to help locate photographs.			✓	✓	✓				
• WDNR plugged into Burnett County's coordinate network, converted land information data into WDNR coordinates, and created a digital tornado boundary "footprint" file.			✓	✓	✓				
•Tornado boundary file overlaid with land information property-address tax file and road-name file to exclude addresses not within tornado's damage area.			✓	✓		✓		✓	
RECOVERY ACTIVITIES									
• Produced large-scale (1:96,000) wall maps of tornado path, property boundaries structure addresses, and roads. This helped assist volunteer efforts and establish debris disposal sites.			✓	✓	✓				
• Provided township-based address/road maps to assist volunteers in the field.			✓	✓	✓				
• Produced high-quality color orthoimagery of the tornado damage area, which assisted volunteers clear access paths, loggers salvage and recycle downed timber, and home-owners assess damage and prepare recovery plans.			✓	✓	✓	✓		✓	✓
• Provided maps to support volunteer organizations in Burnett and Washburn County townships, and in the villages of Siren and Keiger.			✓	✓		✓		✓	
• Produced legal descriptions and addresses of all residents in the village of Siren along with their assessed property values. This helped identify owners of damaged structures, and helped provide damage estimates so county could qualify for FEMAdisaster-relief funds.			✓	✓		✓		✓	
• Identified 450 properties outside the village of Siren within the tornado path by PLSS section and according to tax assessment class for forestry. Provided mailing labels for each owner.			✓	✓	✓			✓	✓
• Created accurate property-parcel data—status of building permits, zoning, legal descriptions, etc˘— within two weeks after tornado. Enabled village of Siren to establish ownership records so new construction could begin.			✓	✓		✓		✓	
• Provided quick, accurate assessment of damage; helped expedite the documentation to federal relief agencies to qualify for rapid financial relief.			✓	✓	✓			✓	

About RGIS

The National Consortium for Rural Geospatial Innovations–Great Lakes is located on the campus of the University of Wisconsin–Madison. It is a USDA Cooperative State Research, Education and Extension Service (CSREES) program designed to promote the use of geospatial information and technologies by communities in rural America. RGIS is dedicated to helping communities understand the concepts and benefits of using geospatial data as well as assisting them in all aspects of GIS development.

Utilizing new desktop digital orthomanager software (Orthomapper), a special map product was developed to assist timber-salvage efforts. Recovery logging operations were under way much faster, more thoughtfully, and more safely for loggers who used accurate orthophotos to devise a plan of attack. Also, debris removal and disposal was expedited, thanks to aid from the Federal Emergency Management Agency (FEMA). Without FEMA's official disaster declaration, debris removal would otherwise be up to each landowner. The BLIS information made it possible for the county to receive the FEMA declaration quickly.

A Sound Investment

It's impossible to put a dollar figure on the staggering losses that result when disaster strikes. In all, Burnett and Washburn Counties received tens of millions of dollars for restitution, debris removal, and staff costs from the Federal Emergency Management Agency (FEMA), Federal Community Block Program, Small Business Administration (SBA), Rural Development Administration, U.S. Department of Agriculture (USDA), and Wisconsin Department of Natural Resources. Additional aid came from private insurance companies and charitable organizations.

What we know for certain is that Burnett County's automated land information system helped curb further losses to property owners, businesses and county offices. By streamlining response and recovery operations, and helping to expedite federal funds to tornado victims, the BLIS saved time, money—and perhaps lives. Ultimately, for a $2 million initial investment, Burnett County residents impacted by the Siren tornado received extensive benefits that proved to be invaluable. In essence, a single disaster has "paid" for the cost of the system many times over.

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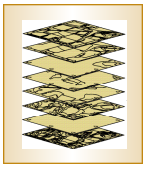

Land Information & Computer Graphics Facility

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