Paper #1205

Using GIS As a Disaster Management Tool

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Abstract

2003 Fires From NASA (NASA)

During the major Wildfire event of 2003 in San Diego County, local, state and federal agencies used Geographic Information technologies extensively to track, assess, and model the effects of those fires on the community.

The fire tracking was performed in near real-time using an entire range of ESRI products along with imagery obtained from remote sensing satellites. Hundreds of situation maps were produced and provided for firefighters, managers, elected officials during the critical stages of the disaster

The recovery effort utilizing E-Team, a powerful new ESRI based accessory, got underway almost immediately. Damage assessment teams visited affected areas to collect data immediately after the firefighters. That data was processed directly into the GIS to assist victims with claims and provide analyses.

GIS tools and technology were central components in managing the chaos generated by these catastrophic events.

Body

The Cedar Fire

In the fall of 2003 Southern California experienced one of the worst wildfire disasters on record. On Sunday October 26, 2003 a major firestorm condition prompted the declaration of a state of emergency in San Diego County. That action automatically activated the county's Emergency Operations Center.

The San Diego County firestorm complex of 2003 consisted of three major fires. The Cedar Fire (280,278 acres) was by far the largest and most devastating. Eighty thousand of those acres burned over a ten-hour period. Fifteen lives were lost including that of a firefighter. 2820 structures were lost.

The Paradise Fire consumed 56,700 acres, two fatalities and 413 structures. The Otay Fire burned 46,291 acres and destroyed six structures. Fortunately no lives were claimed. More than ten thousand people were evacuated and temporarily displaced.

The Emergency Operations Center (EOC) provides a central framework for the representatives of various county departments of many disciplines can interact seamlessly and function as a team.

The San Diego County regional GIS, SanGIS, is the base map for the CAD (Computer Aided Dispatch) System. Emergency vehicles, both fire and police, are dispatched and routed using GIS base map data. Many are also tracked using GPS technology.

Tracking the fires and providing maps for reports in near real time was a daunting task. GIS staff were equipped with the latest versions of ESRI products running on high end machines, but communication challenges arose in the early going.

There were several computer networks each with their own security that needed to function together for GIS purposes. The data itself came in a variety of formats and projections.

The footprint of the fire was generally tracked via satellite imagery. MODIS (moderate resolution imaging spectroradiometer). Up-to-Date Perimeter Mapping was facilitated by CDF utilizing airborne GPS tracking units.

CATS Damage Report

Recovery Effort

It was known early on that sites needed to be identified and mapped to expedite both property and resource restoration efforts. This information was critical for obtaining both state and federal aid as well as streamlining the permitting process for reconstruction.

Damage Assessment Teams entered burn areas immediately after the firefighters moved on, sometimes before. It was essential to identify ownership of the damaged areas at the parcel level. These teams were equipped with Global Positioning Receivers and they collected location data that was matched to the parcel database for identification.

Collecting Location Data With GPS

Software Tools
ArcView, ArcInfo, ArcPad ,ArcIMS, CATS (Consequences Assessment ToolSet) E-Team, Pathfinder Office and Terra Sync.

Analyses
Location of structures was provided to the structure protection group during the fire. Post fire analysis of the damage assessment data was performed to help determine if recent changes in the fire code adequately protected life and property. Analyses include:

> –Where were the concentrations of damage?
> –Where were structures exposed to fire that did not burn?
> –Building Material Analysis
> –Topographic Analysis
> –Vegetation Type and Required Clearances
> -Notification List For Property Owners Affected By Mitigation

Additional analyses included definitive mapping of the burn area, habitat loss analysis, fire management plans for parks and communities, debris assessment and removal (Done

with an ArcPad application for recovery effort), tree removal area prioritization, permit tracking for fire victims and customer service.
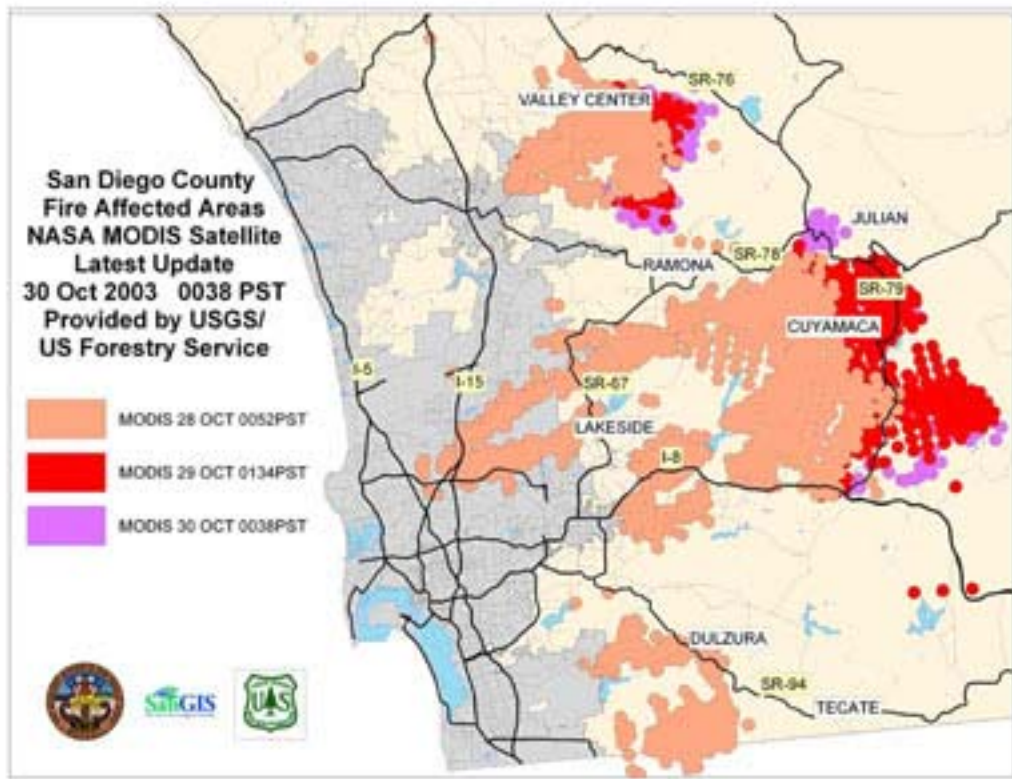
Data to web sites

Mapping data was made available to a wide variety of interested agencies. Some utilized it for warehousing and distribution, other agencies or groups posted the data to internet mapping sites. These included the SanGIS Map Library and the County of San Diego home page. Local media outlets were also provided with situation maps.

Impacts

The Recovery process:

In terms of planning and land use, the recovery process for fire was largely handled through ministerial actions, so that fire victims would have not have to experience delays in their rebuilding process. To expedite this process, all parcels with structural damage were identified and the information was loaded into the Oracle automated permitting system, KIVA, so that these identified permits would be given special attention.

In addition to helping fire victims in their efforts to rebuild, mobile GIS surveys were conducted with ArcPad to document where structures were damaged and the debris was

not cleaned or removed. This process involved 7 field teams revisiting the damage sites with a custom ArcPad interface
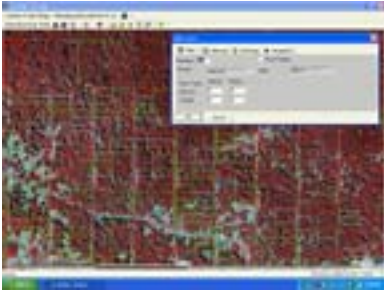
ArcPAD Interface

Fire Code Changes

Fire code changes were evaluated and the existing code was subsequently considered adequate with some modifications. Brush clearing distances were increased and the importance of individual fire plans and analysis in community design were given elevated importance. GIS was and will be used with all of the above components, specifically with community design and fire management plans.

Agencies Represented
County of San Diego, City of San Diego, SanGIS, California State Office of Emergency Services, California Department of Forestry, U.S. Forest Service, FEMA, San Diego State University, The American Red Cross, and Science Applications International Corporation SAIC).

Acknowledgements
P1205001 NASA Space Imagery

Damage Assessment

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