

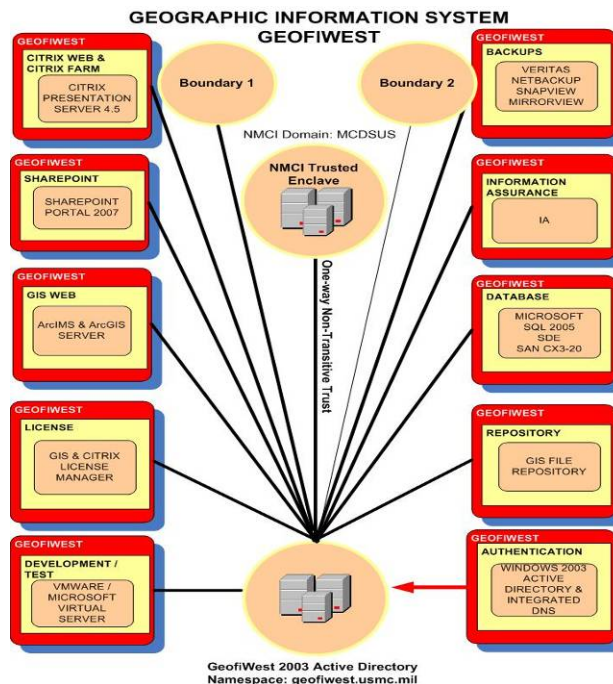
Marine Corps Leverages GIS During the 2007 Southern California Wildfires

Abstract

During the wildfires of October, 2007 the regional geospatial data center located on Camp Pendleton, CA played a central role in supporting the Marine Corps' response to protect people and property aboard the military installation and the surrounding community. As huge wildfires spread throughout San Diego County, to include four fires aboard Camp Pendleton burning more than 21,000 acres of the Installation, the Camp Pendleton emergency operations center leveraged GIS technology to effectively track and respond to the situation. ArcGIS Server provided a "common operational picture" that enabled the Marines to annotate and track local incidents, integrate information from multiple sources to include Cal Fire data and NASA predator drone imagery, analyze and plan evacuation routes, and coordinate response efforts through a single browser-based solution.

'GIS' System Overview

Through the Marine Corps GIS program Camp Pendleton established the West Coast Regional Geospatial Data Center known as GEO*Fidelis* (GEOFI) WEST. Based on ESRI technology the Center provides an enterprise geospatial information system consisting of a centralized geodatabase leveraging ArcSDE, a centrally-managed ArcGIS Desktop suite served via CITRIX, a common browser-based map viewer, collaboration and communication tools via Microsoft SharePoint Portal/MOSS, and web map services and browser-based editing via ArcGIS Server. Staffed with GIS analysts, programmers and systems administrators the Regional Center currently supports eleven (11) Marine Corps Installations and has the capacity and capability to rapidly support new and emerging needs as illustrated during the Southern California wildfires of 2007.



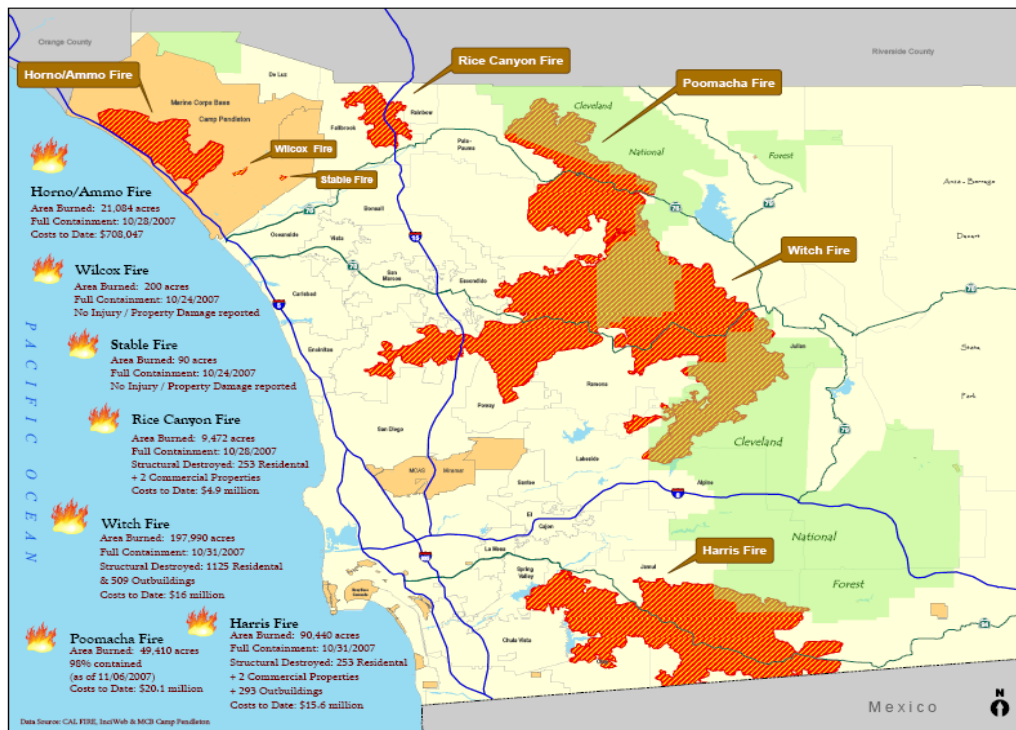
Wildfire Data Requirements

During the wildfires the Camp Pendleton emergency operations center was activated requiring GIS staffing and data support "24/7." This required a GIS analyst in the emergency operations center as well as at least one analyst in the GEOFI WEST regional center at all times. With limited staff due to residential evacuations and road closures available staff had to work long hours over rotating schedules and junior staff needed to work with limited support under time sensitive conditions. Additionally, a multitude of external, constantly-changing wildfire related data needed to be identified, obtained and integrated into the enterprise GIS as fast as possible.

To accommodate multiple map products and formats simultaneously all data were processed and added to the enterprise ArcSDE geodatabase. Significant data quality issues were encountered with data provided from other agencies which required additional processing prior to integrating into ArcSDE. Data sources, update intervals and processing procedures were drafted and posted for each staffing schedule/shift. Data requirements included:

- 🔥 **Wildfire Perimeters** (State, County and Camp Pendleton specific)
- 🔥 **Evacuation Areas** (County and Camp Pendleton specific)
- 🔥 **Road Closures** (County and Camp Pendleton specific)
- 🔥 **Traffic Reports**
- 🔥 **Facility Closures** (Camp Pendleton specific)
- 🔥 **MODIS Hot Spot Points**
- 🔥 **Thermal Imagery**

Fire Perimeter as of 11/07/2007

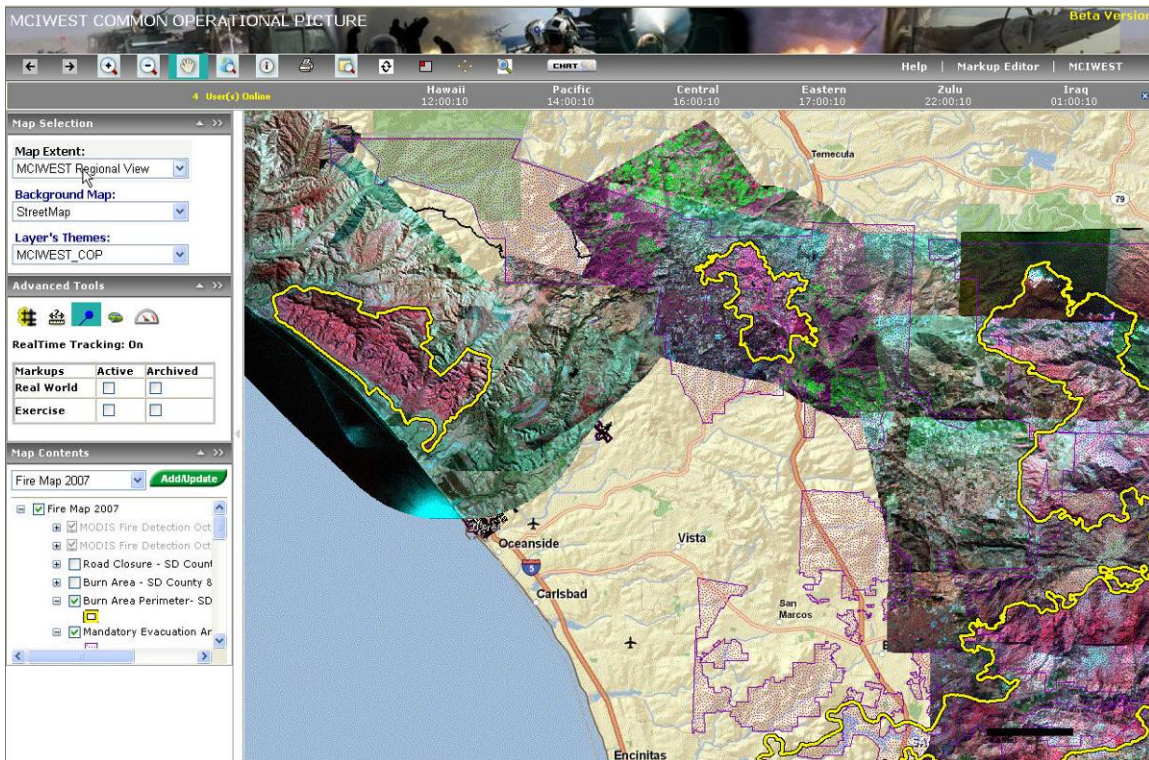


Common Operational Picture

The GEOFI WEST center had an established browser-based mapping application leveraging map services provided by ArcGIS Server reading from the ArcSDE enterprise geodatabase. All internal Marine Corps data and externally-owned base map and incident data were merged into a single geodatabase to support a common view for all applications (i.e. ArcGIS Desktop and ArcGIS Server).

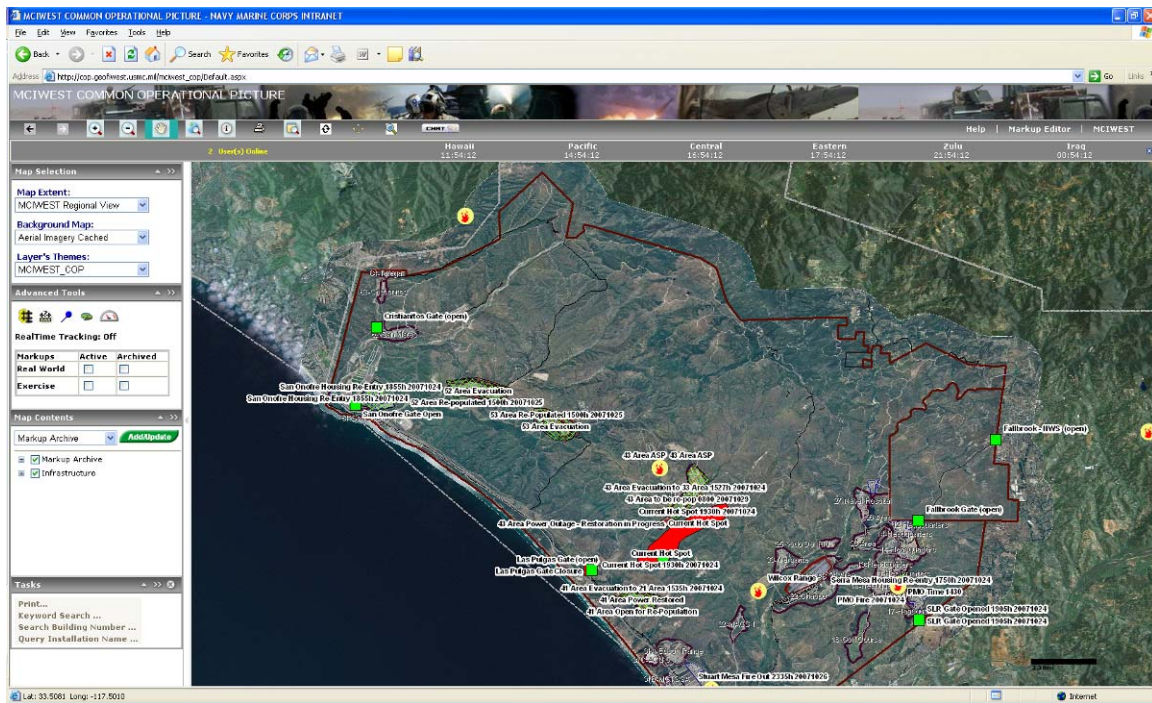
Data layer options included ArcGIS Server cached map services of Marine Corps owned imagery and ESRI Online map services to provide several different “background” views. To optimize performance several pre-defined map services, or themes, were configured. By default only a basic map consisting of common GIS layers was visible with optional map services for overlay such as environmental constraints, land use and utilities.

During the wildfires GIS analysts continuously updated incident-related data in the system and on-site programmers added or adjusted functionality as-needed to provide an accurate common operational picture to the Camp Pendleton emergency operations center. Other Marine Corps operations centers leveraged the common operational picture to include the Marine Corps western regional command Marine Corps Installations West (MCIWEST) also located on Camp Pendleton, Marine Forces Pacific (MARFORPAC) located in Hawaii, and Headquarters Marine Corps (HQMC) located in Washington, DC.



Real-time Mark-up

Camp Pendleton experienced four different wildfires during the week-long event burning more than 21,000 acres causing the evacuation of housing areas and the closure of roads and service-related facilities. As new incidents or status reports were received in the emergency operations center via radio, phone or email the GIS analyst on staff utilized an ArcGIS Server edit session (edit task) to plot and annotate the information directly on the browser-based common operational picture for all to see instantaneously. The Camp Pendleton-specific wildfire locations and road closure layers generated through ArcGIS Server were provided to the San Diego County emergency operations center and incorporated into the county-wide wildfire map updates provided to County emergency responders and the public.



Conclusion

ArcGIS Server successfully facilitated a common operational picture for the Marine Corps and proved versatile enough to support rapidly changing requirements. The dependency on geospatial awareness was highlighted during the wildfires and GIS is now a permanent component to all planning and crisis management operations aboard Camp Pendleton and throughout the GEOFI WEST area of service. The week-long wildfires allowed standards for incident mapping products to be tested under real-world circumstances and adjustments have been made to improve performance and reduce data processing time during future events.

The Camp Pendleton GIS department and GEOFI WEST center staff were honored with a special Headquarters Marine Corps, GEOFidelis Director's award for the services, capabilities and high level of commitment provided during the 2007 Southern California wildfires.

2007 Wildfire Support - Lessons Learned (Outline)

The following is a brief list of emergency operations GIS support lessons learned:

1. Staffing
 - 1.1. Cross train and document because key personnel may not be available
 - 1.2. Plan for 24/7 shifts/support by adjusting schedules immediately
 - 1.3. Provide food and refreshments for evening, night and weekend shifts
 - 1.4. Foster and reward staff commitment and leadership year round
 - 1.5. Ensure there is a designated seat for GIS analyst in the EOC
2. Data
 - 2.1. Sources may be plentiful but many may be unreliable
 - 2.2. Plan for Geometry errors when establishing data processing procedures
 - 2.3. Public source websites will become overloaded and crash
 - 2.4. Instantaneous enterprise data updates require consistent naming convention
 - 2.5. Document external data sources & frequency of updates
 - 2.6. Retain all external data downloads with date & time for post-incident analysis
 - 2.7. Metadata on external data sources will be queried by command staff
3. Liaison
 - 3.1. Expect to provide workspace for visiting incident support staff
 - 3.2. Pre-establish county and state EOC contacts and access accounts
 - 3.3. Data exchange between all relevant agencies benefits everyone involved
4. Applications
 - 4.1. 24/7 on-site support is best to ensure proper use of GIS products
 - 4.2. On-line mark-up capability crucial to ensure timely information distribution
 - 4.3. On-site developers provide needed flexibility
 - 4.4. Common Operational Picture (COP) needs to ingest KML/KMZ files
 - 4.5. Custom 'chat' tool within COP mitigates restrictive communications protocols

References

For Information on the *GEOFidelis* program see www.geofidelis.net

The GEOFI WEST Portal can be found at <https://portal.geofiwest.usmc.mil>
(currently only available from within the Marine Corps Intranet)

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