GIS Preservation of Mammoth Consolidated Mines, CA

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Introduction

What we know about history is obtained from history books that tell us about a temporal state of events. GIS allows us to add a spatial dimension to historical data. Due to a number of factors, historical sites are being lost with the passage of time. For example, buildings made of biodegradable material eventually are destroyed due to natural degradation and the elements, and start to fall apart to the point they become completely lost to us. While some of these historical landmarks still exist we need to use the resources available to us to preserve them. Using GIS to create maps that record historic sites before they are completely lost is essential to preserving history and enabling potential restoration efforts. This project demonstrates how this can be done by combining existing spatial layers with data collected form field surveys and UAV technologies for the Consolidated Mines study area in Mammoth, CA (Figure 1).

Figure 1. Location of the Mammoth Consolidated Mines in California.

Data and Data Sources

Data were gathered from a number of different sources. The first being the image that I created from the flight that I ran with the Phantom over the mining camp. The Magnetic Anomaly layer was found on USGS.gov. This dataset gives us an idea where valuable minerals might be located based on their magnetism. The Three layers (Buildings, Mines, and Missing Buildings) were all produced through ArcGIS. The Image of the old claims around the consolidated mines was provided by hdl.huntington.org.

Table 1. *List of data and data sources used in the project*

Dataset	Source
Image of Mammoth Consolidated Mines	DJI Phantom
Magnetic Anomaly Map	http://pubs.usgs.gov/sm/mag_map/mag_s.pdf
Building Layer	ArcGIS
Mine Layer	ArcGIS
Missing Buildings	ArcGIS
Cartography of Lake District in 1879	http://hdl.huntington.org/cdm/ref/collection/p15150coll4/id/2709

Methodology

For the first part of my project I took a Phantom Helicopter equipped with a GoPro camera and flew it over the region. I then went through the mining camp and took pictures and measurements of all the buildings that were still standing and all of the mining equipment that remained there, as a great deal of it has been removed over the years.

I then merged all the aerial images that I had taken through PhotoScan to create a raster layer showing the current area (Figure 2). I then went through and created the layer showing the locations of all the buildings that currently remain within the mining camp. I also created a layer showing the two mines. Then each photographic image that I had of the buildings were linked to the corresponding building which they were taken of on the building layer, mines layer, and missing structure layer (Figure 3). For the missing structure layers I created points rather than polygons to represent them.

Next thing that I worked on was mineral analysis. To do this I found a Magnetic anomaly map of North America that took a reading of the magnetism of the minerals found throughout the country. Taking this information and comparing it with other mines that were high producing we can get a better idea as to whether this mine was in a promising location or not.

Figure 2. *Image of what remains of The Mammoth Consolidated Mines today, image created with images taken from a DJI Phantom Helicopter with a GoPro Camera.*

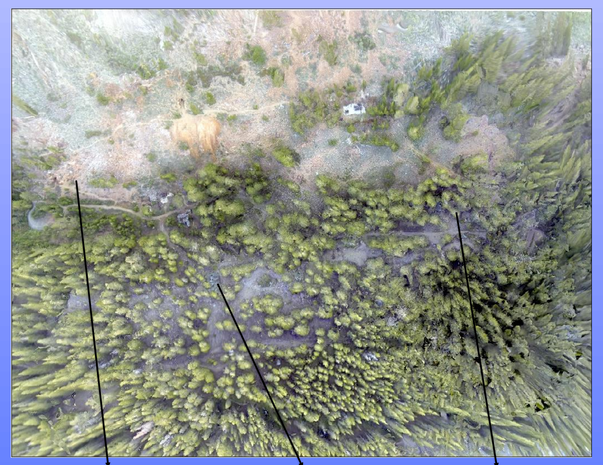

Figure 3A, B, and C. Figure 3A is of the lower mineshaft. Figure 3B is Bunkhouse One. Figure 3C is of the Mahan Cabin.

Results

The overall result of this data collection and processing effort is an interactive map showing the remaining buildings around The Mammoth Consolidated Mines (Figure 4). As you click on each individual building from the building layer an information window opens describing what the building was used for and images of what it currently looks like (Figure 5).

A magnetic anomaly layer that shows the magnetic pull in this area. Based on this image, the magnetic pull is a lot lower than what can be found around higher producing mines such as those found in Bodie, CA, which is located about 50 miles north of The Mammoth Consolidated Mines. This information indicates that the Mammoth Consolidated Mines were not going to produce as much gold and silver as Bodie.

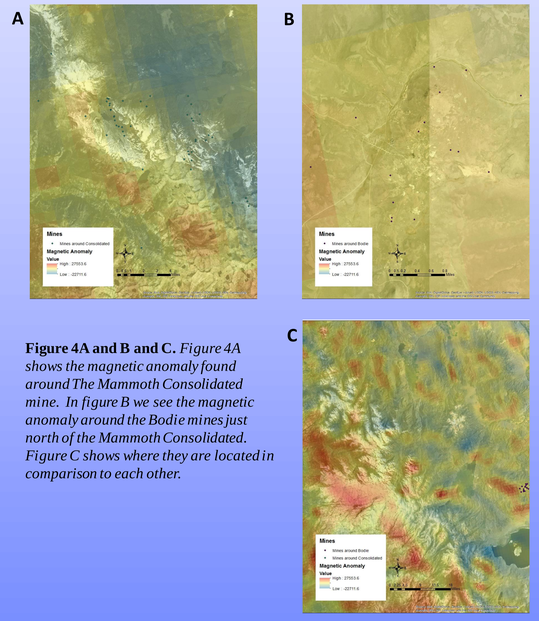

Figure 4A and B and C. *Figure 4A shows the magnetic anomaly found around The Mammoth Consolidated mine. In figure B we see the magnetic anomaly around the Bodie mines just north of the Mammoth Consolidated. Figure C shows where they are located in comparison to each other.*

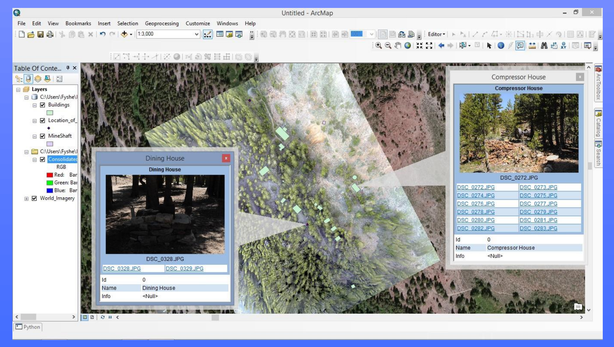

Figure 5*. Screenshot of an interactive map and use of an HTML Pop-up window in ArcGIS.*

Timeline

Dates:	
July 9th	Images collected and merged
July 24th	Data Collected
July 28th	Layers created
August 1st	Magnetic Anomaly Layer added
August 9th	Data Linked to Layer
August 15th	Project Completed
August 16th	Presentation

Discussion

Preserving what we know about a historical location before it is completely destroyed through collecting images and physical data of that significant site still is possible. While the Government does not have the resources to preserve the physical remains, using GIS and emerging technologies such as UAV-based data collection provides a good starting point for preserving the data that we have about these places that undoubtedly would otherwise disappear.

Based on the Magnetic Anomaly layer that I used to see if the Mammoth Consolidated Mines was ever going to strike it rich or was doomed to fail, I would say that they would have been destined for minimal success if any. While not in a high magnetic area like Bodie, they still had a some readings. Most likely the area was good for wages but not for fortune.

The end results is an interactive map that can be modified as more information about Mammoth Consolidated Mines is found.

Conclusion

As time marches forward and we add yet another and another day to the history books time itself take toll on our physical historic sites. Without the preservation of these places through data collection they are inevitably destined to become the stuff of myths and tales with little basis for future study. We owe it to future generations to try and preserve what we can in any way that we can and GIS is one of the best tools available to help us to better understand it all.

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