

# Viet Nam in 3D: Using Geospatial Technology to Better Understand Military History

Brandon Schleicher and faculty mentor Joseph Hupy, Ph.D.  
University of Wisconsin - Eau Claire, Department of Geography



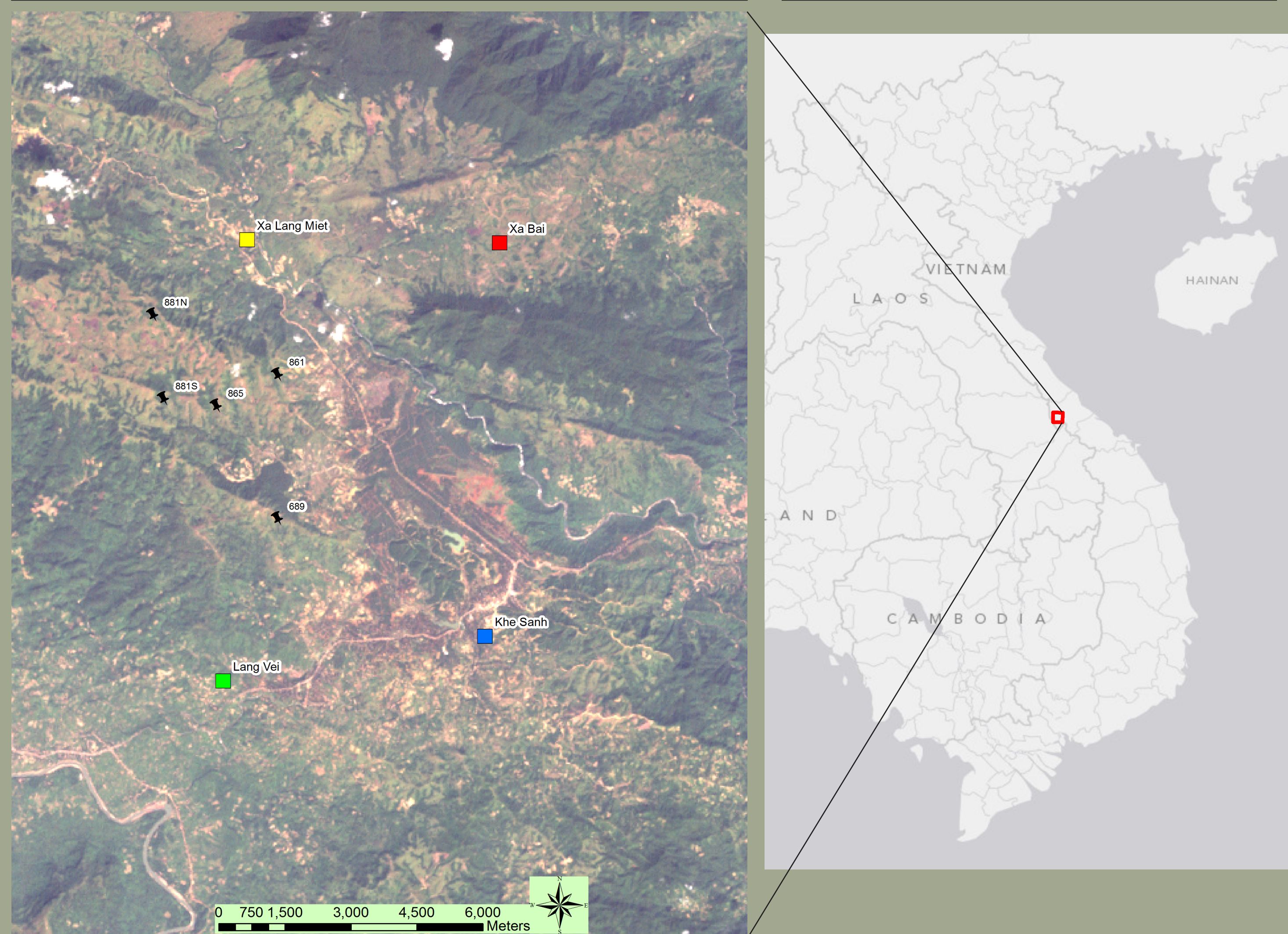
## Introduction

### Abstract

Many Viet Nam conflict historians have struggled with describing the tortuous relief of the Viet Nam landscape. Traditional hard copy maps, lacking a three-dimensional perspective, along with mere textual descriptions, are often inadequate in describing how terrain was one of many difficulties soldiers faced during the Viet Nam conflict. Advancements in computer mapping technology have provided a valuable set of tools for visualizing historic information. This computer based mapping technology, along with many new forms of high resolution data, promises to provide audiences interested in Viet Nam history with an accurate depiction of the landscape. This study focuses on the Khe Sanh battlefield, and how the relief and its hilltops were key factors in the battles that occurred there in 1967 and 1968. The sand table President Johnson had constructed to monitor the events of the siege that occurred there in 1968, when compared to these modern depictions of the terrain, did little justice towards relating how the enemy harnessed the formidable terrain towards their advantage during that historic event. This case study illustrates one of the many advancements geospatial technologies such as

### OBJECTIVES

- In this study, I'm exploring new mapping technologies that provide the most effective means of portraying a three dimensional landscape
- The Khe Sanh battlefield was notorious for its steep gradient and dense vegetation giving rise to the importance of controlling the hilltops. For this reason I decided to choose it as my study area
- Traditional methods of mapping prove to be inferior, in that they fail to give their users an easily understood sense of relief.
- Recent improvements in mapping technology allow Viet Nam conflict historians to fully understand and depict the difficulties of the terrain.



## Photo Obliques



This photo was taken at the main Marine position on hill 881S. In the distance to the left, you can see hill 861 and its ridgeline.



Above is a photo taken from hill 865 facing hill 689's northwest slope. In 1968 the NVA had mortars positioned on the other side of the ridgeline. The maximum effective range of an 82mm mortar places this vantage point within range.

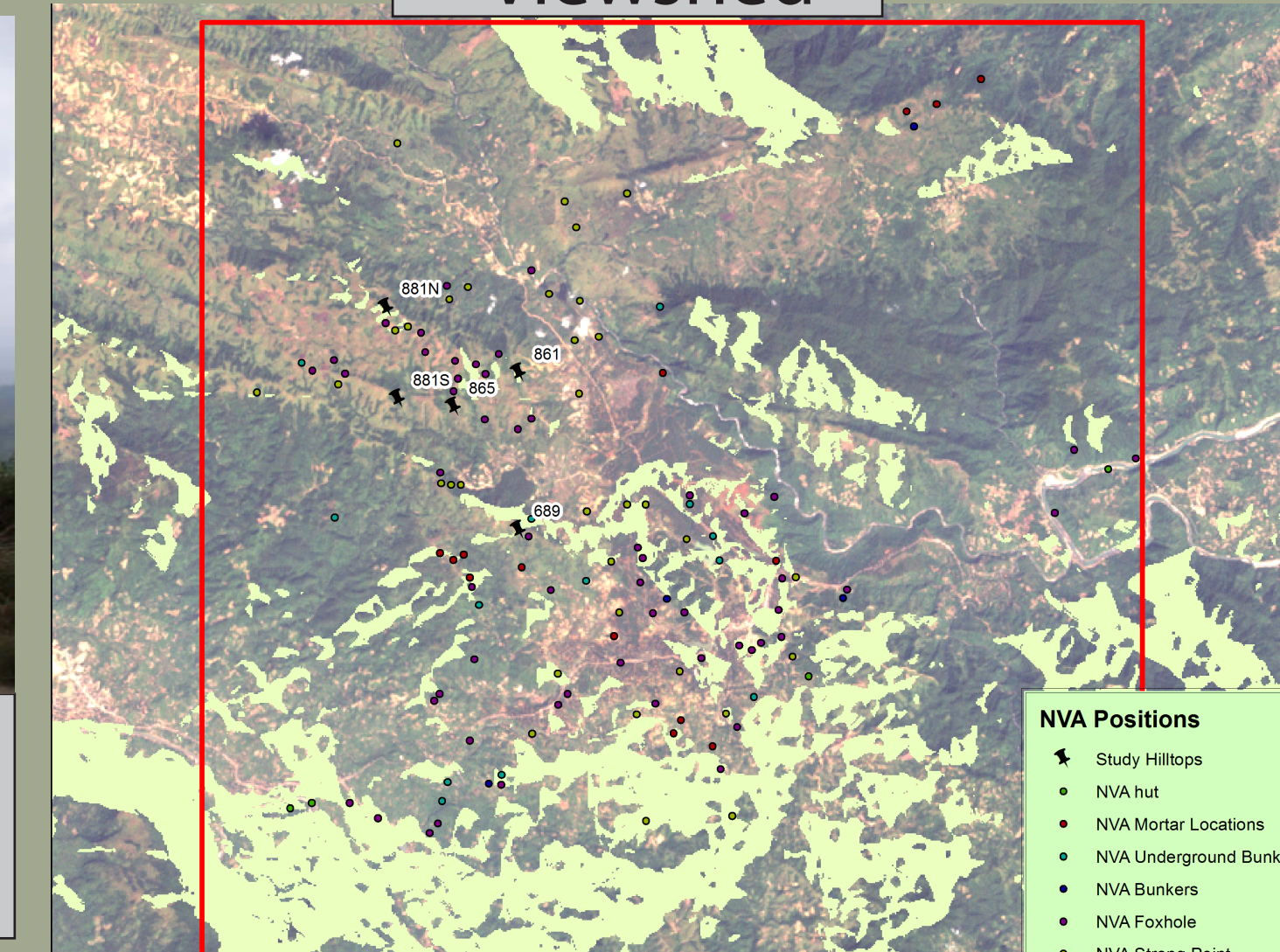


This oblique was taken on hill 881S and is facing southwest down a steep, heavily vegetated valley. The NVA would use terrain such as this to their advantage by coaxing out Marines attempting to rescue the remains of their fallen, and ambushing them.



Above is a photograph of a Marine CH-46 flying above Khe Sanh. Above the Chinooks rotors, is the Khe Sanh Combat Base. In the lower left corner Route 9, a main supply road for Khe Sanh Combat Base, can be seen.

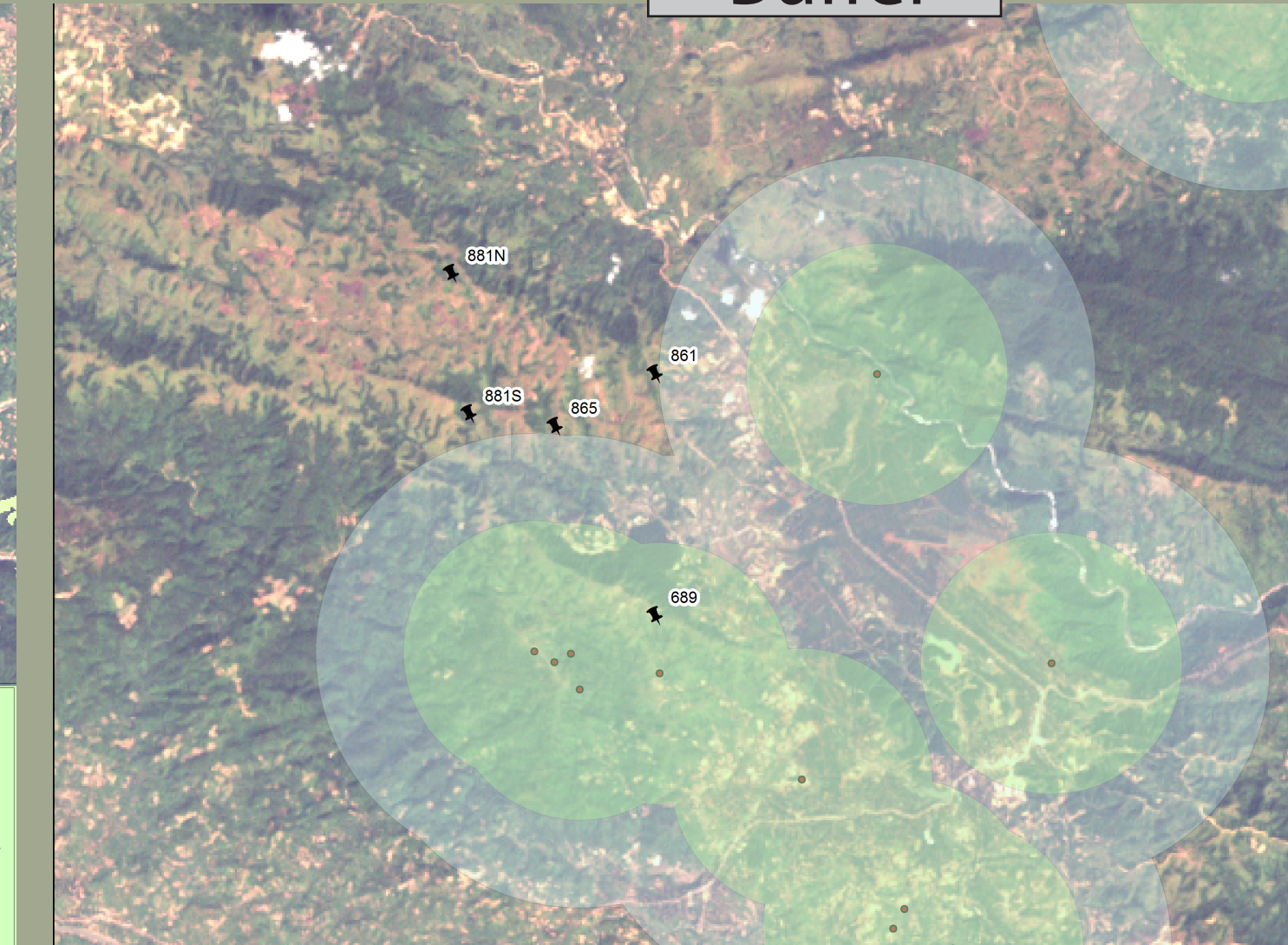
## Viewshed



Depicted above is a rough portrayal of the viewshed one would likely see standing on hill 881S. Hill 881S was controlled by the US Marine Corps in contrast to the NVA controlled hill 881N. Analysis of data such as this makes it helpful in determining why the enemy established positions where they did as well as numerous other pieces of information. The viewshed tool can be used for any point feature within the software. By running this tool on NVA positions you would be able to identify danger zones for US ground forces.

## Analysis

### Buffer



The image to the left shows known enemy mortar positions in relation to the hills being studied. The large, transparent circles are buffers created to visualize the effective range of two different sized mortars. Green: 66mm (radius: 1,820m) Blue: 82mm (radius: 3,040m)

## Model Obliques

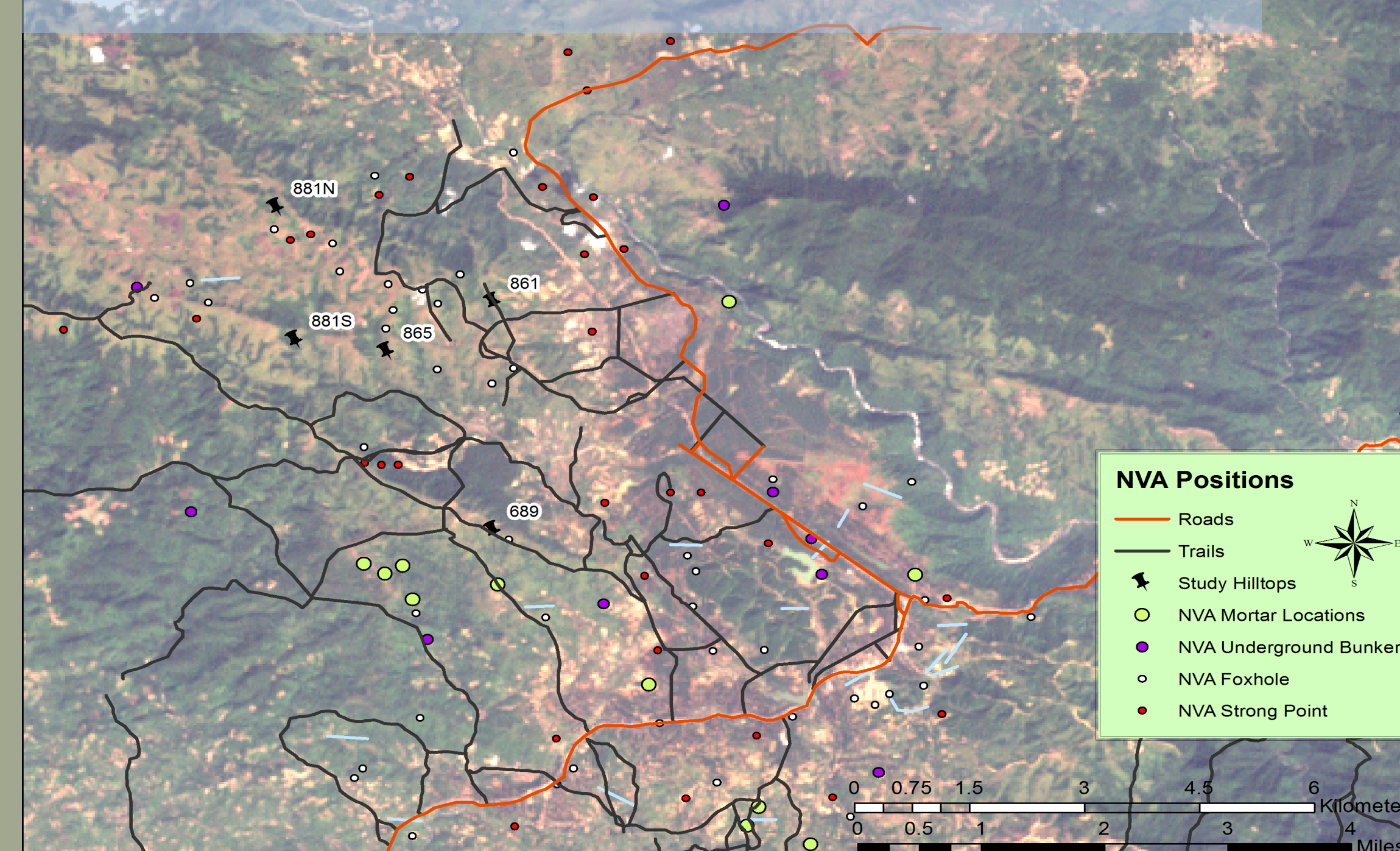


Above is a three dimensional render of Hill 881N and Hill 881S. This technology works well in showing smooth transitions in elevation across a given area. A hillshade effect has been added to give the observer a better sense of the relief. Hillshade simulates the sun's illumination and gives the user the ability to control its position.



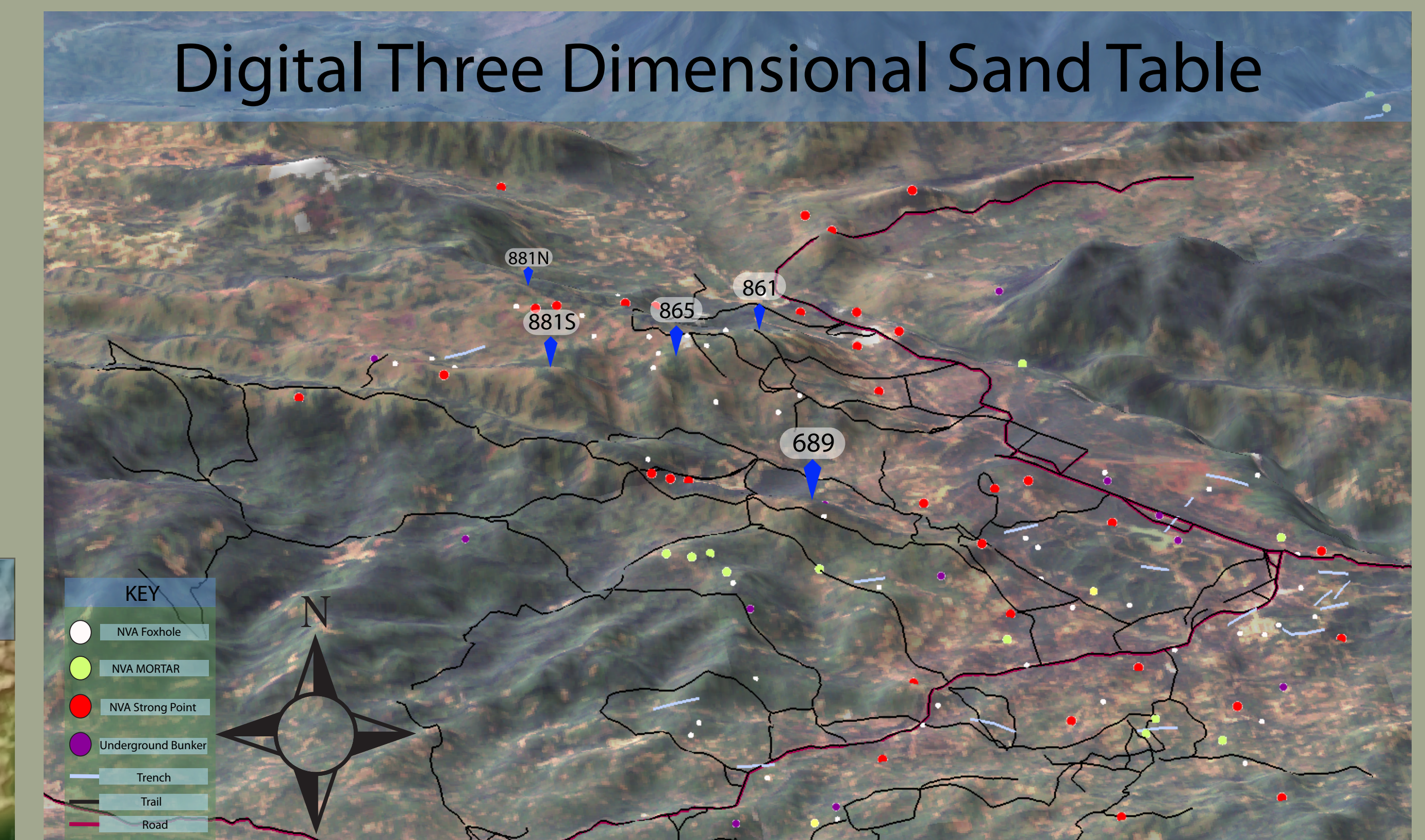
This image is a three dimensional render of hill 689 and its northeastern slope. It is quite similar to the image on the left, however, a landsat satellite image is draped over it.

## Two Dimensional Sand Table



Above is a two dimensional sand table that was constructed containing the features that will be portray in the three dimensional model. In determining which features to select, the user should think about what conclusions may be drawn from this data.

## Digital Three Dimensional Sand Table



This image is by far the most accurate representation of the Earth's surface compared to the others. By combining all of the previously mentioned techniques, overlaying the two dimensional sand table, and exporting the data into a different software, we can render the image into a three dimensional model that allows you to explore the landscape at various obliques and azimuths. This technique is very valuable to military historians and current military strategists.

## Historic Background

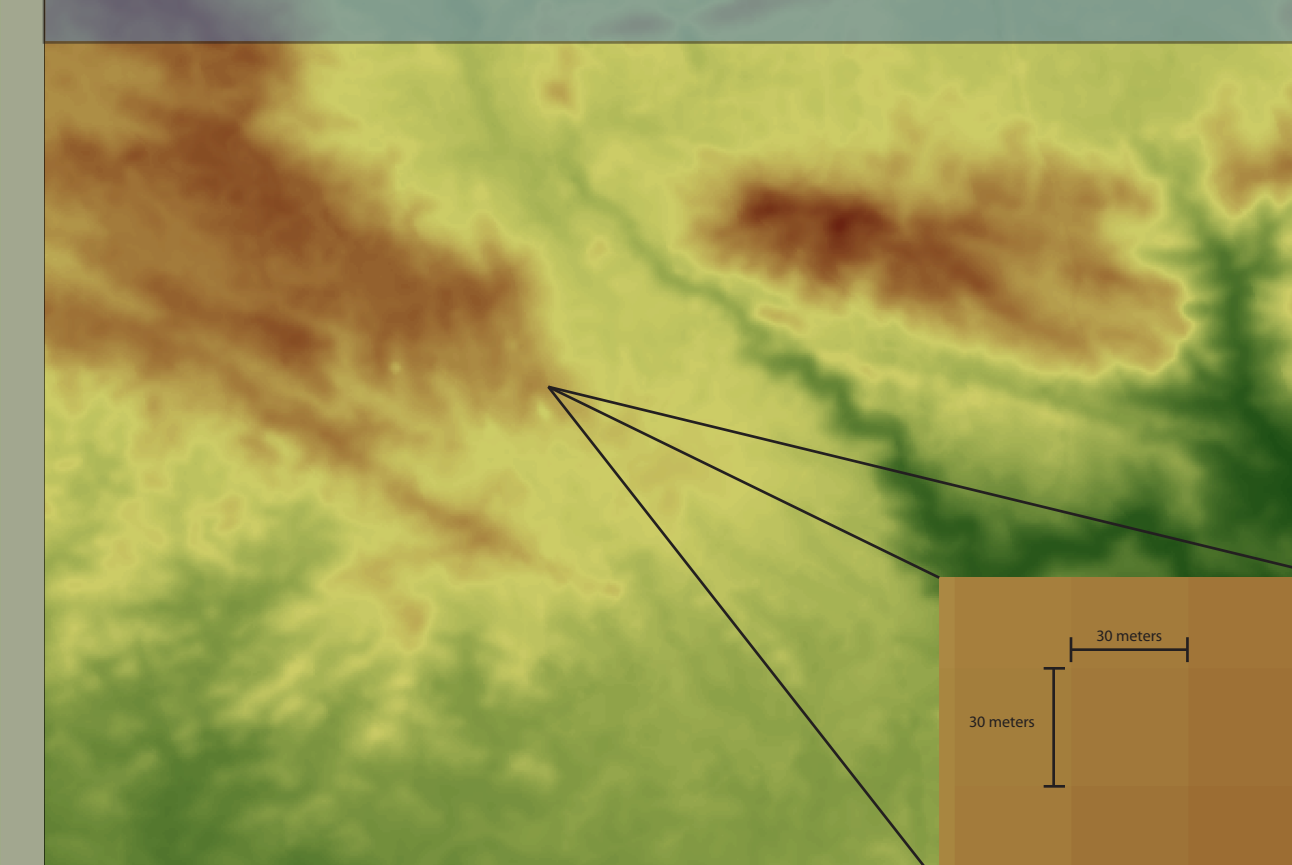


This image is a rare photograph capturing Lyndon B. Johnson observing the sandtable constructed to better his understanding of operations on the Khe Sanh battlefield. Left to Right: George Christian, President Lyndon B. Johnson, Gen. Robert Ginsburg, Walt Rostow (February 16, 1968)



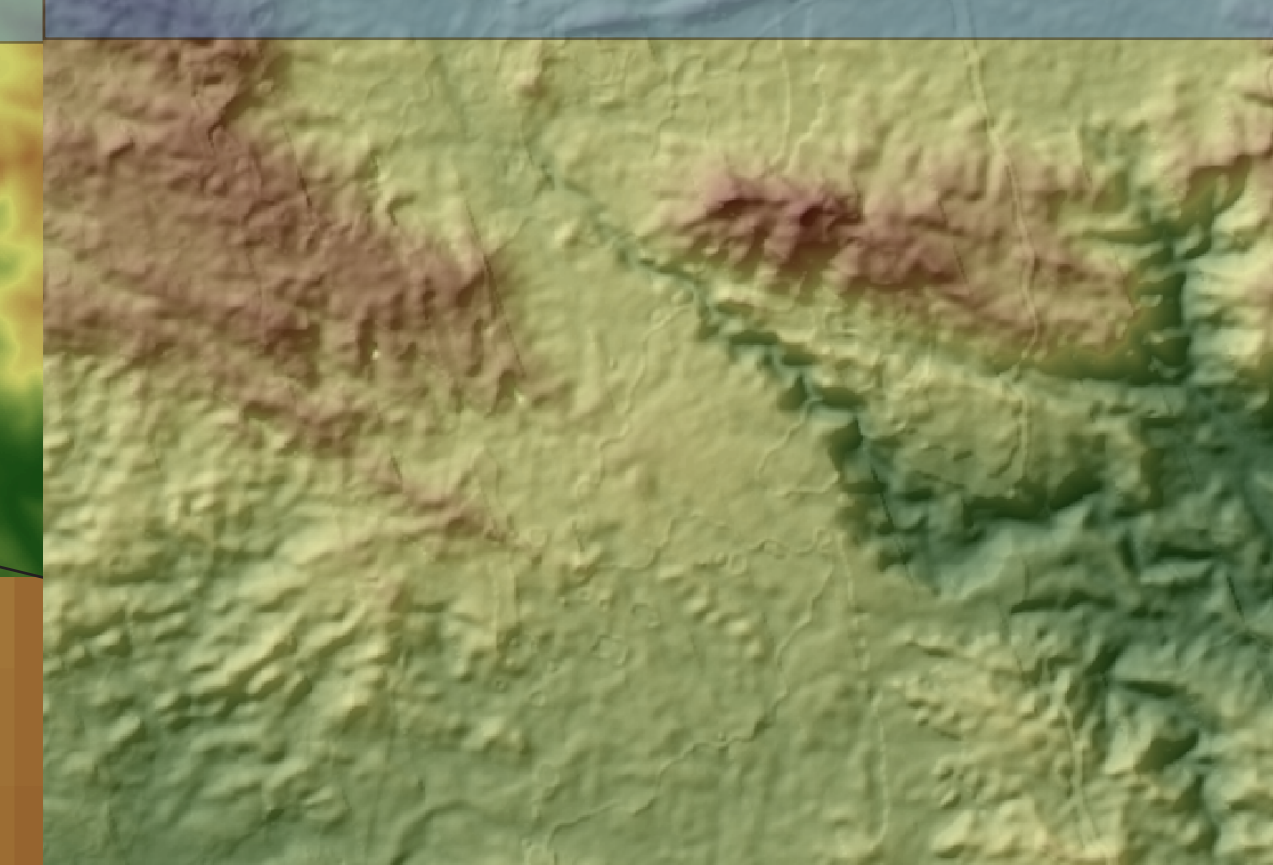
Below is a more recent photograph of the same table being observed above. Although the table was constructed to show relief of the terrain, notice how little justice it gives in portraying the actual terrain observed on the ground.

### DIGITAL ELEVATION MODEL

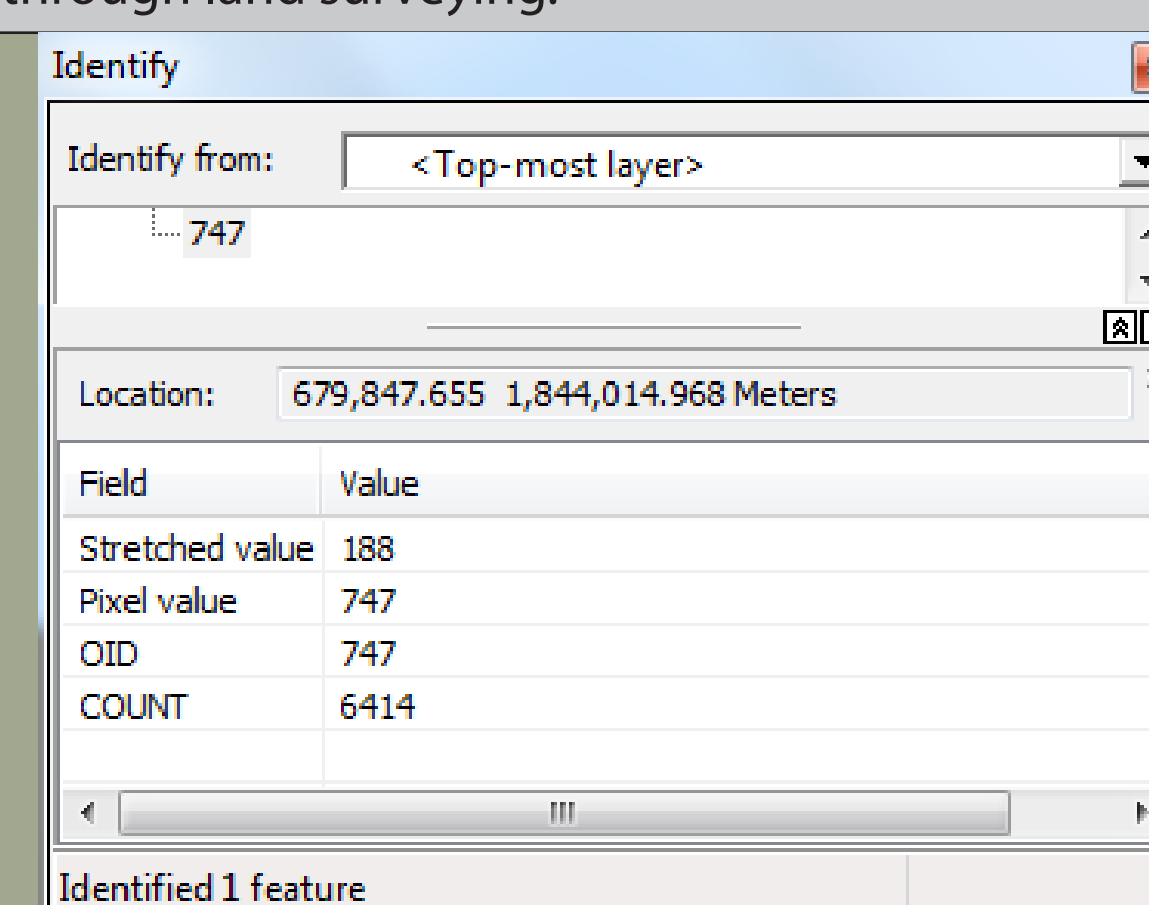


A digital elevation model (DEM) is a raster image that stores elevation data. Each grid square or pixel within the image has a spatial resolution of 30 x 30 meters. Within the pixel's data there is also an elevation attribute stored. For example the pixel selected above has an elevation of 747 meters designated in the window below under pixel value. A bi-modal color scheme is used to assign pixel values a color. DEMs are constructed using either remote sensing techniques, or through land surveying.

### HILLSHADE DEM DRAPE



As you can see, the above image is much more helpful in showing changes in elevation. Instead of simply using the bi-modal color scheme of the DEM, this image is also draped over a hillshade image. By setting the DEM image to 30% transparency the hillshaded effect combines with the DEM.



## Conclusions

The research you see here is only in its preliminary stages. Currently I am collaboration with Viet Nam conflict author and historian, Michael Archer to provide three dimensional maps to help his readers visualize the Khe Sanh landscape. The data shown within this poster only shows a few of the many possible features that can be portrayed. As I import more spatial features, myself as well as any future researchers will be able to conduct an increasing amount of analysis. The end result is not only to portray spatial features on a map with a three dimensional aspect, but more importantly, the conclusions one can conclude as a result of these features. Another goal of mine is to add a temporal aspect to the model so that one can visually observe the changes that occurred across the battlefield during the 1964-1968 years. Using Mike's expertise of the Khe Sanh area, I will continue to add to my model in a way that allows historians to draw upon the conclusions they would like to portray.

### Acknowledgements:

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