

# Utilizing NASA Earth Observations to Identify and Protect Ancient Chacoan Sites Throughout the San Juan Basin, New Mexico

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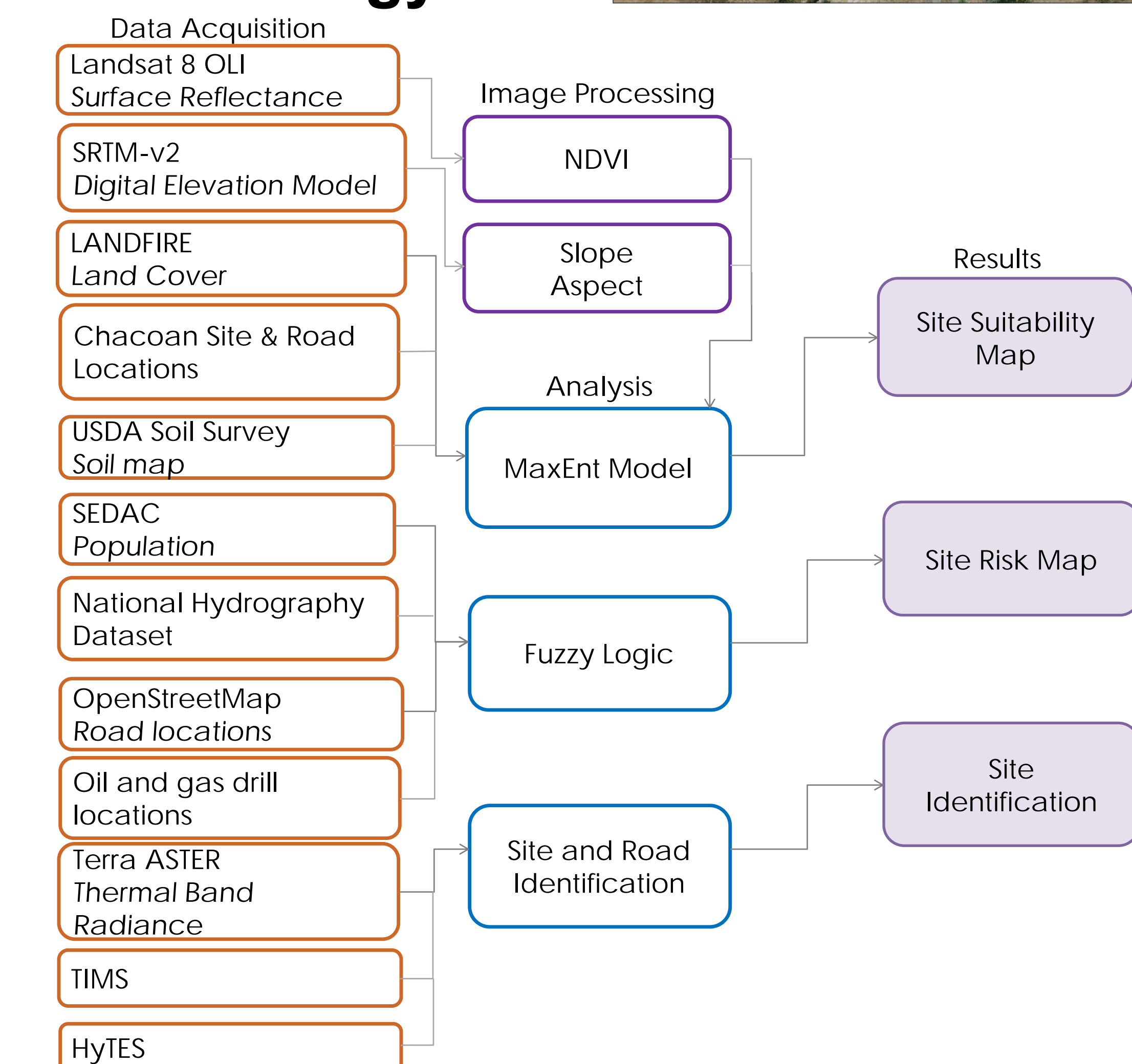
## Overview

The Chacoan people flourished in northwest New Mexico between 850 and 1150 AD. Today, remnants of their monumental architecture draw over 40,000 visitors each year to Chaco Canyon National Park. However, many Chacoan roads and communities are located outside the national park boundaries, putting them at risk from developing infrastructure associated with natural resource extraction. This project utilized Landsat 8 Operational Land Imager (OLI) surface reflectance, Shuttle Radar Topography Mission Version 2 (SRTM-v2) digital elevation models (DEMs), Terra Advanced Spaceborne Thermal Emission and Reflectance Radiometer (ASTER) thermal radiance, Thermal Infrared Multispectral Scanner (TIMS) thermal radiance, Hyperspectral Thermal Emission Spectrometer (HyTES) emissivity and land surface temperature, and various ancillary datasets to identify areas with a high probability of habitat suitability for Chacoan sites, to determine known sites that are at risk from developing infrastructure, and to delineate the boundaries of these ancient communities. The National Park Service will use these products to help prioritize preservation, excavation, and protection of this important cultural heritage.

## Objectives

- **Identify** areas that are suitable locations for unknown Chacoan communities and roads
- **Identify** areas with Chacoan communities and roads that are at a high risk for destruction from developing infrastructure
- **Identify** Chacoan communities and roads using NASA earth observations

## Methodology



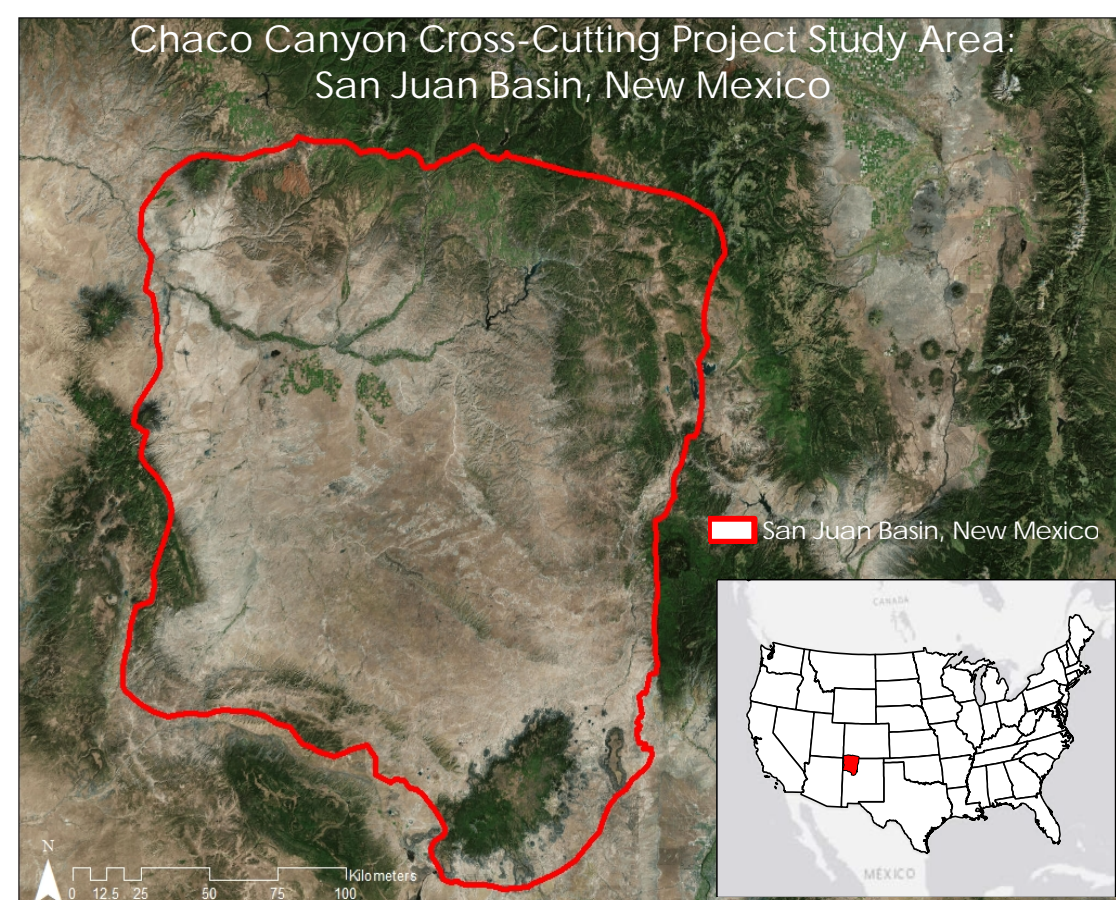
## Conclusions

- Many known Chacoan sites and roads are at risk for destruction from developing infrastructure
- Low resolution imagery from Terra ASTER and Landsat 8 are not as useful for identifying Chacoan sites and roads as higher resolution imagery from TIMS and HyTES
- Future projects could increase the robusticity of the risk map by obtaining the locations of destroyed sites, obtain more full coverage TIMS and HyTES imagery, and obtain very high resolution imagery.

## Acknowledgements

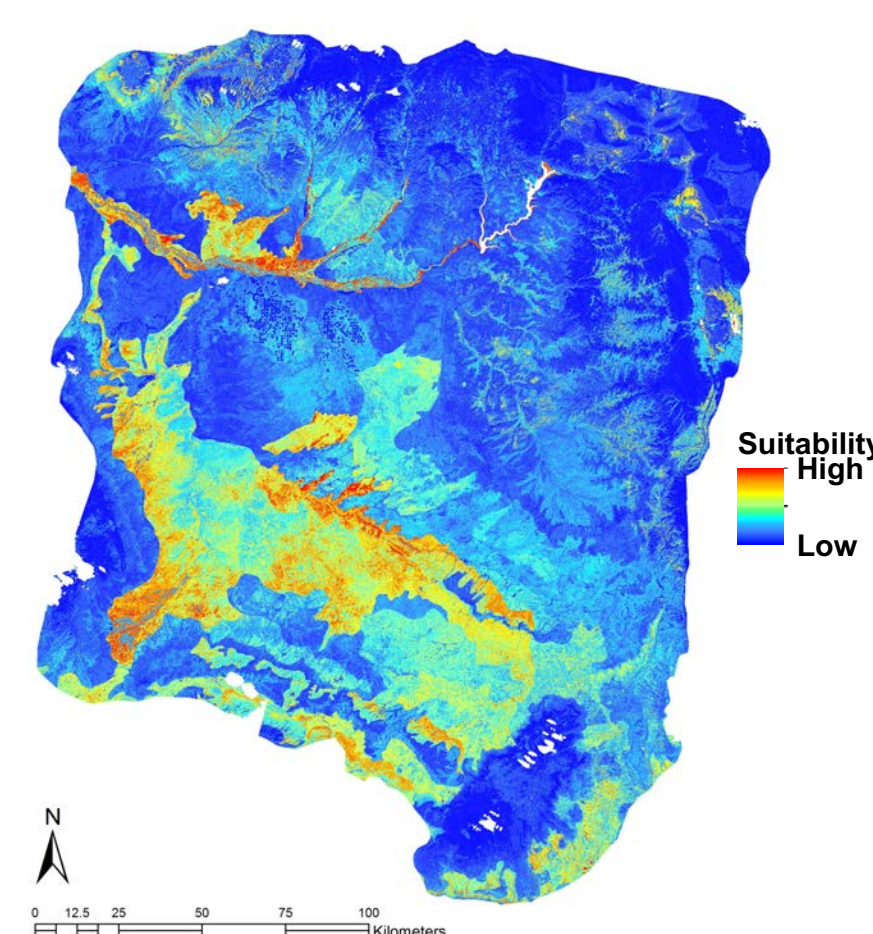
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## Study Area

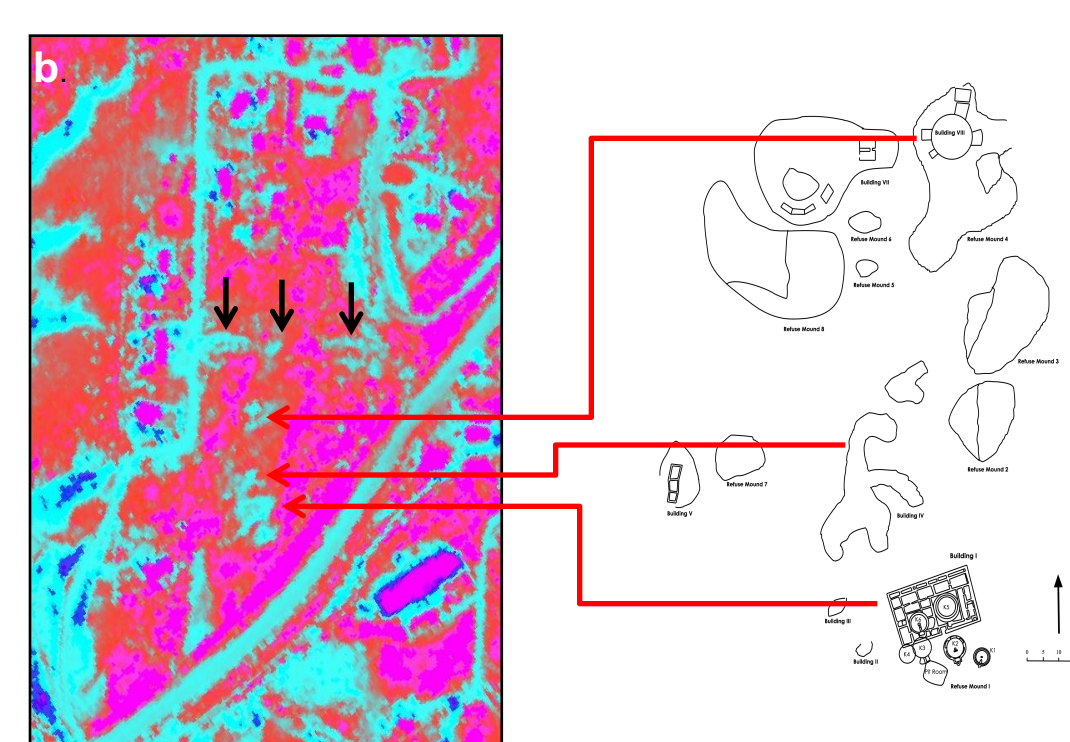
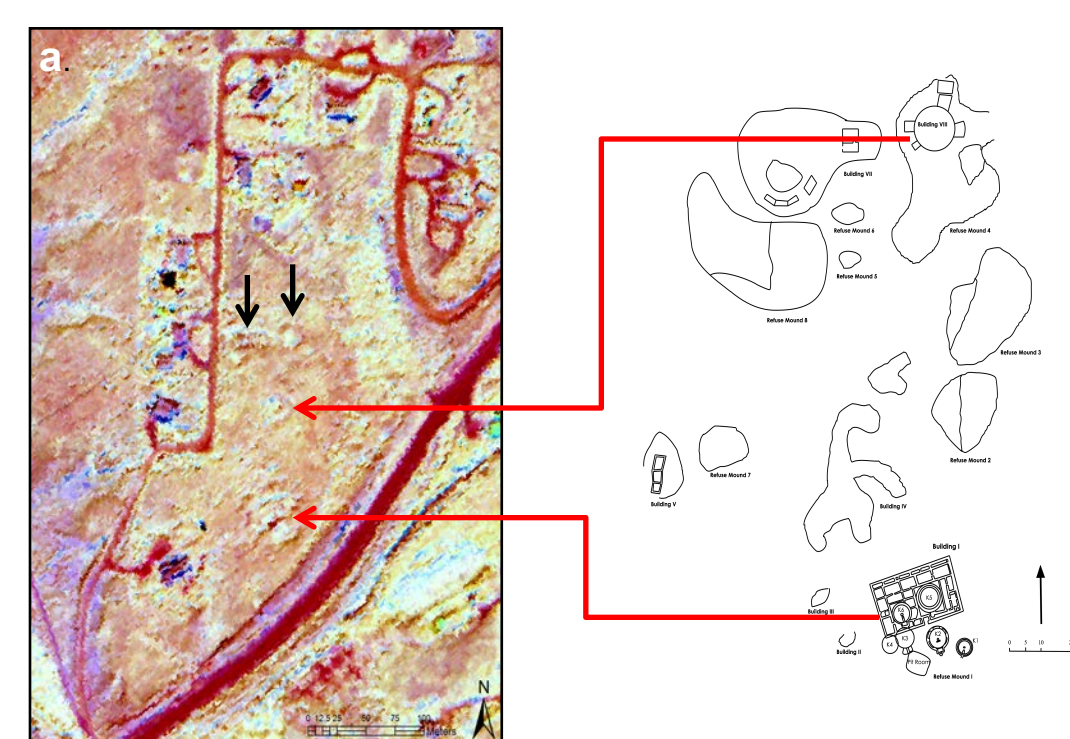
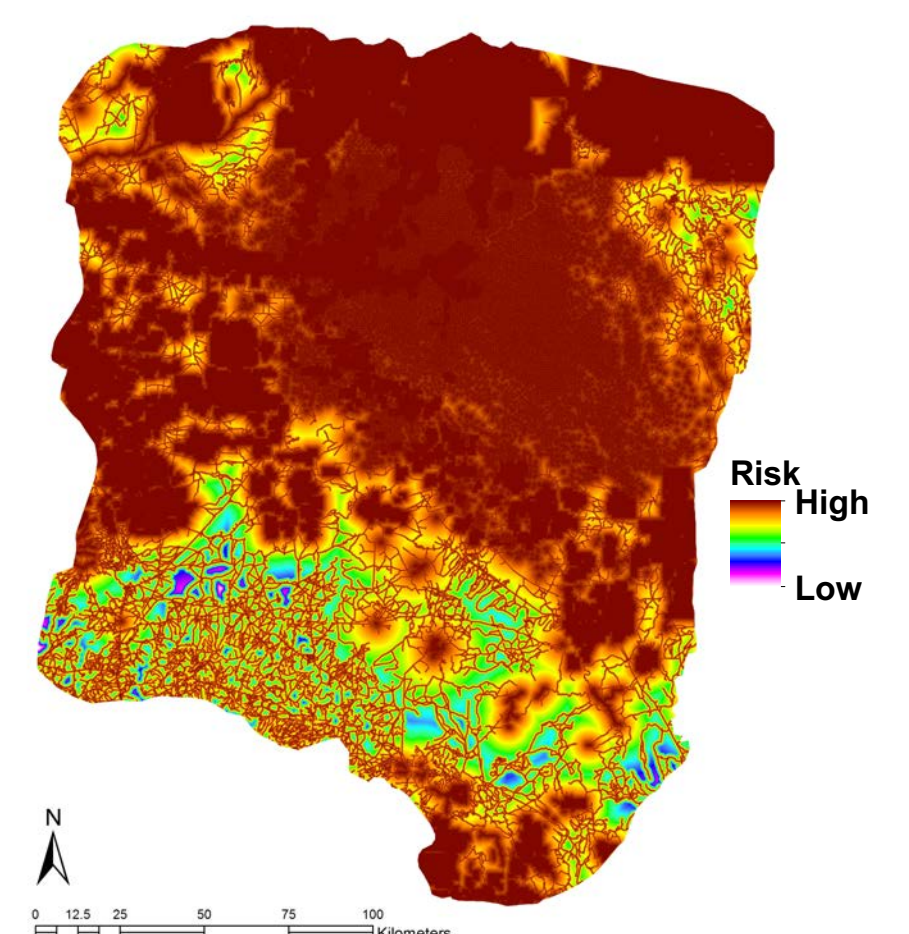


## Key Findings/Results

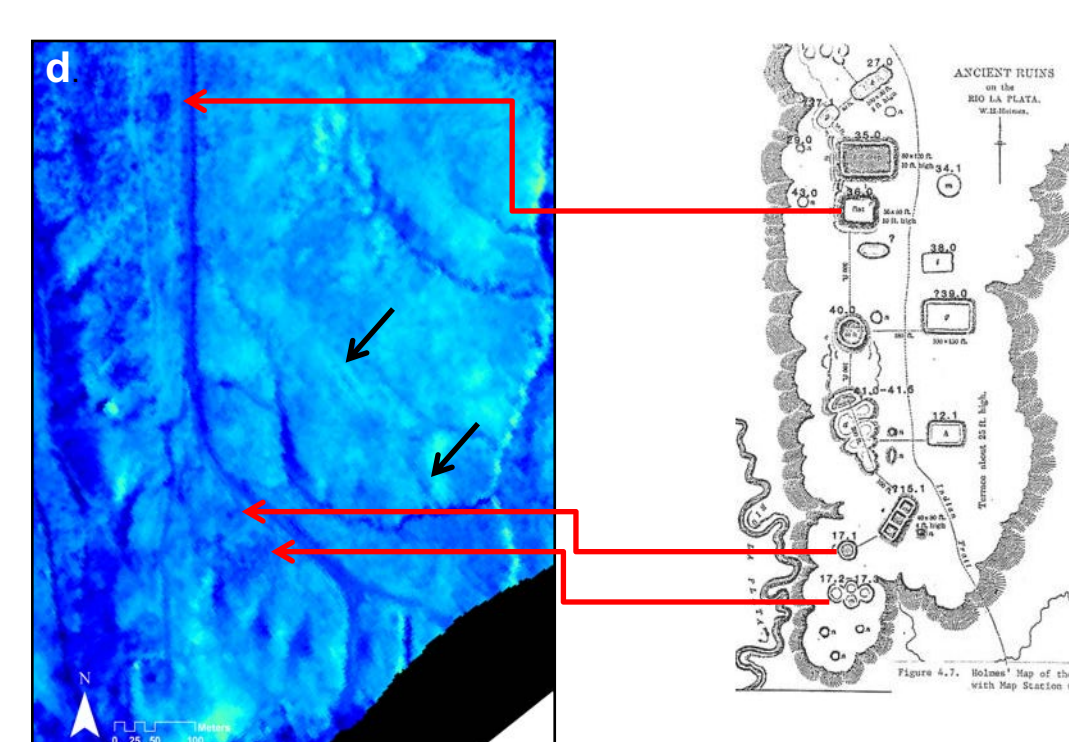
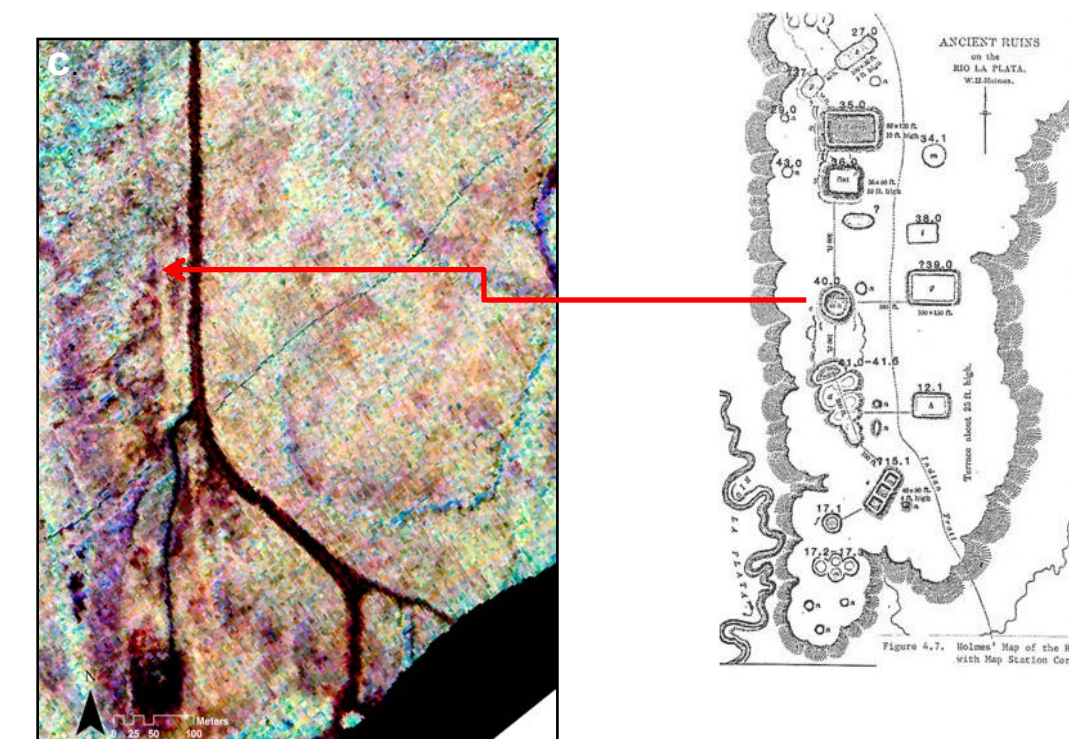
Chacoan Site Suitability Map



Chacoan Site Risk Map



Figures a. and b. are HyTES imagery of the Morris 39 site. Figure a. is emissivity. Figure b. is land surface temperature with a band combination of 3,1,2, and a decorrelation stretch. Red arrows indicate known features; black arrows indicate unknown features.



Figures c. and d. are HyTES imagery of the Holmes Group. Figure a. is emissivity. Figure b. is land surface temperature with a band combination of 3,1,2, and a decorrelation stretch. Red arrows indicate known features. Black arrows indicate unknown features.

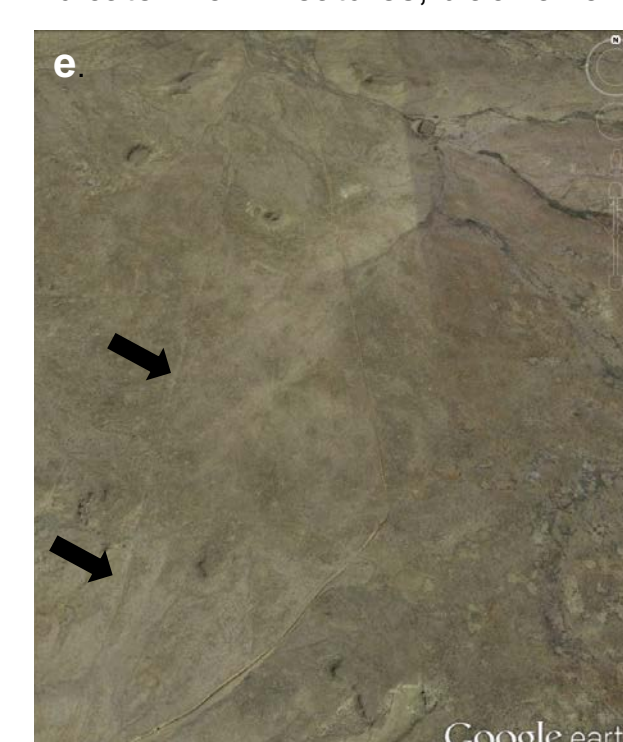


Figure e. shows a GoogleEarth image of a known Chacoan road, indicated by the black arrows.

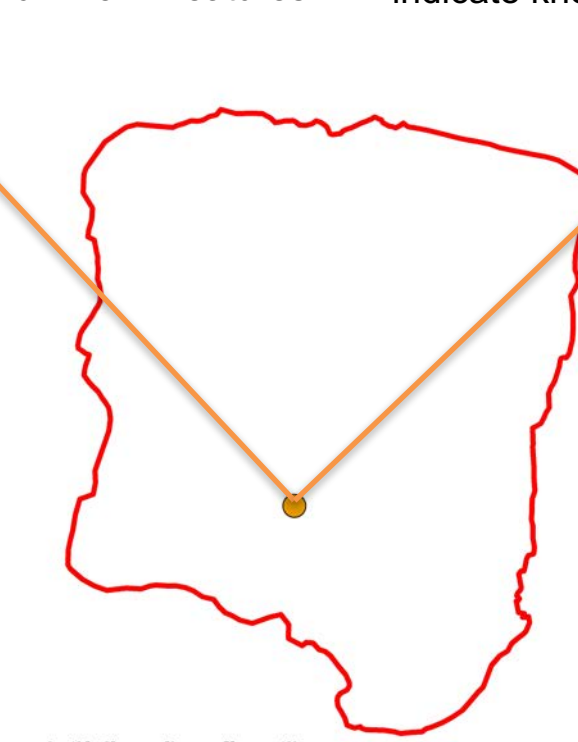


Figure f. shows the location of a known Chacoan road in the TIMS data with a 1,2,6 band combination and a decorrelation stretch. The road is indicated by the black arrows.