Suitability Study for Placing Fire Detection Cameras in San Bernardino National Forest California

Introduction

Fire lookout towers are being decommissioned as they become outdated by more efficient technology. They are being replaced by fire detection cameras, which can monitor forests 24/7 and have 360 degree viewing capabilities. The area of study is San Bernardino National Forest located in Southern California.

Preparing the Data

Before starting any processing or analysis on the project, there were several things I did to prepare the data:

- Mosaic all the DEMS that were a part of the study area
- Mosaic all the Land Cover Data that were a part of the study area
- Clip both the DEM and Land Cover mosaics to the boundaries of the forest
- Clip all other vector data to the forest boundaries
- Create a hillshade of the DEM

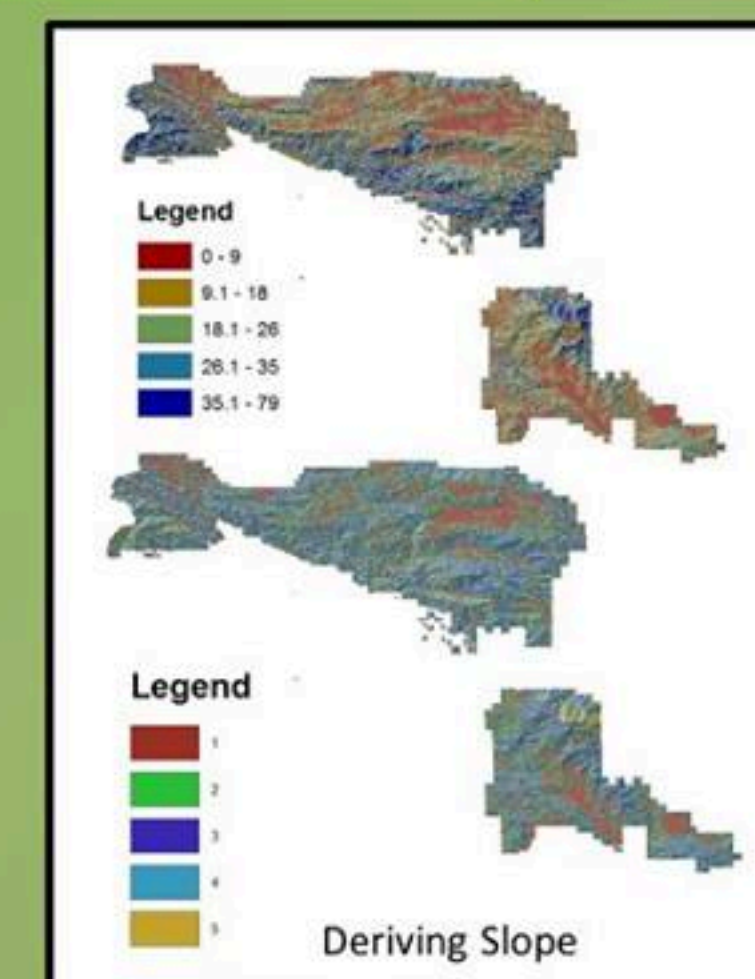**Figure 1.** Clipped DEM, with hillshade,(top) and Land Cover data (bottom)

Figure 2. Derived slope from the DEM (top). Reclassified the slope values to favor higher angle slopes (bottom).

Figure 3. Created a 1 mile buffer around fire origin points, using data from 2000-2015 (top). Converted the buffer to a raster dataset and reclassified to favor only areas within the buffer (bottom).
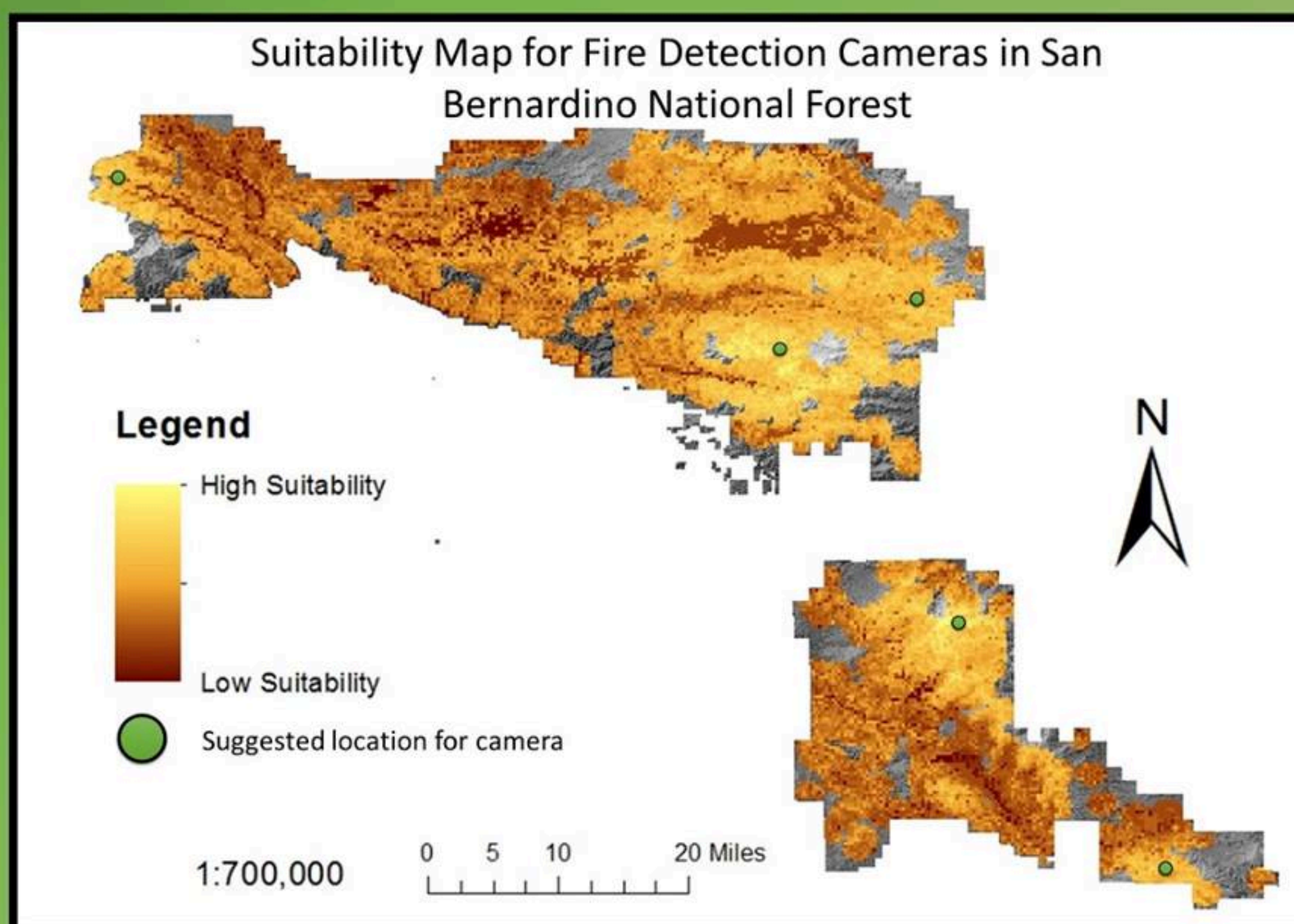

Figure 4. Used the previously clipped DEM and reclassified it favoring higher elevations.

Figure 5. Used previously clipped NLCD and reclassified it to favor vegetation more prone to burning. Forest and brush was classified with high values. Water and developed land were given low values.

Figure 6. Used Viewshed on the DEM at 10 highest peaks in the forest. Reclassified the Viewshed raster to only consider visible areas.

Suitability Map for Fire Detection Cameras in San Bernardino National Forest

Legend

- High Suitability
- Low Suitability
- ● Suggested location for camera

1:700,000

Figure 7. Final suitability map. Used the reclassifications from Figures 2-6 and the Weighted Sum tool to create it. Elevation was weighted heaviest at .25 of the total. Land cover data and viewshed were both weighted at .20, and the fire origin buffer and slope were both weight at .175, for a total weight of 1. Five possible locations were chosen for placement of fire detection cameras based on the suitability study.
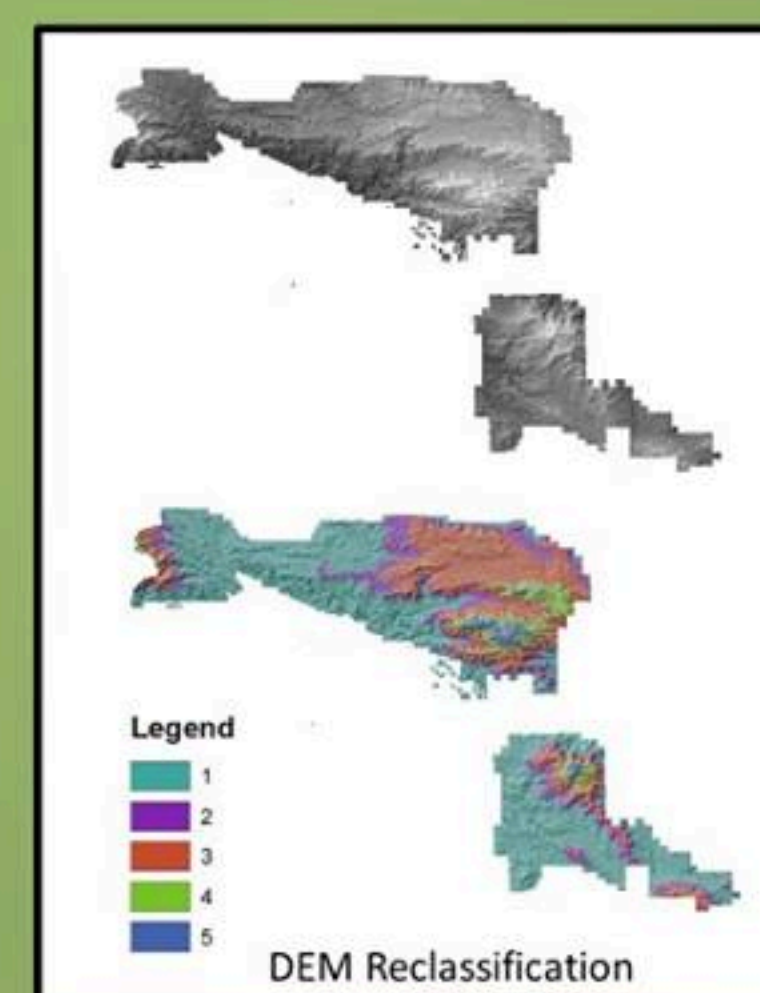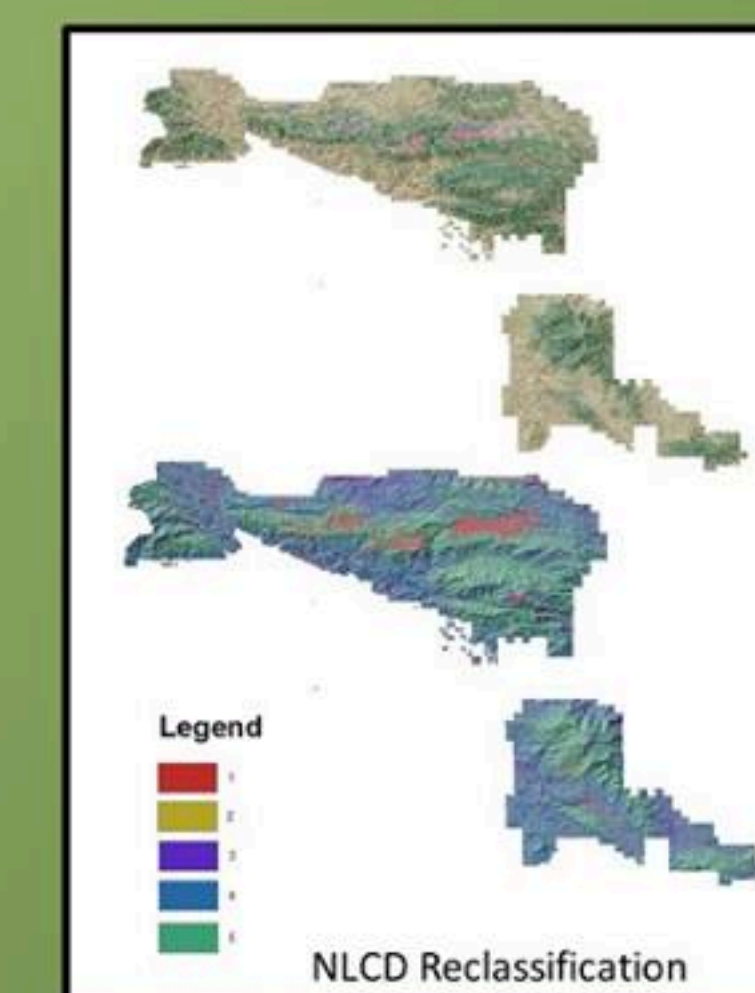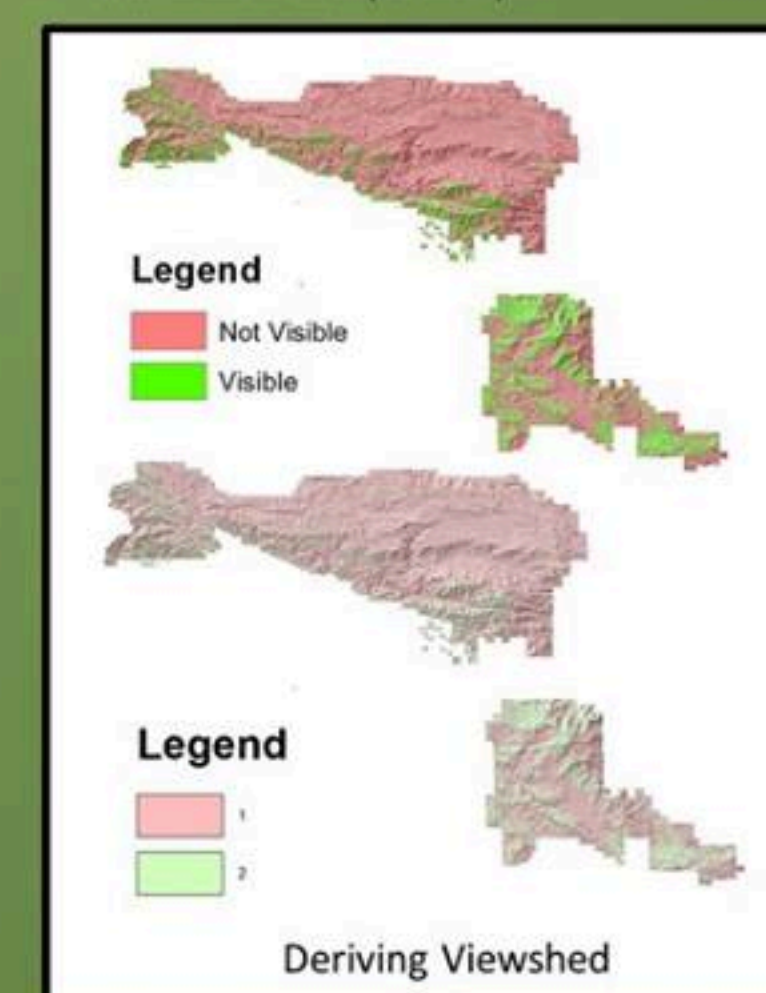
Conclusions and Reflection

The map reflected results that should be expected, showing the highest suitability near mountain peaks and lowest suitability in valleys. New methods I used in this project was the Viewshed tool. It uses a lot of processing power and can take a very long time to process results if using a large number of observation points. I tried doing it in small batches and also one point at a time, and found small batches of 5-10 to work best for this project.

Data and Sources:

- ➢ USDA National Forest Service portal
  - Forest boundaries (vector)
  - Forest roads (vector)
- ➢ USGS Federal Wildland Fire Occurrence Data
  - Fire origin data (vector)
- ➢ Census.gov TIGER Data
  - Water (vector)
- ➢ USGS National Map Viewer
  - DEMs 1/3 arc second (raster)
  - Land Cover Data 2011 (raster)

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