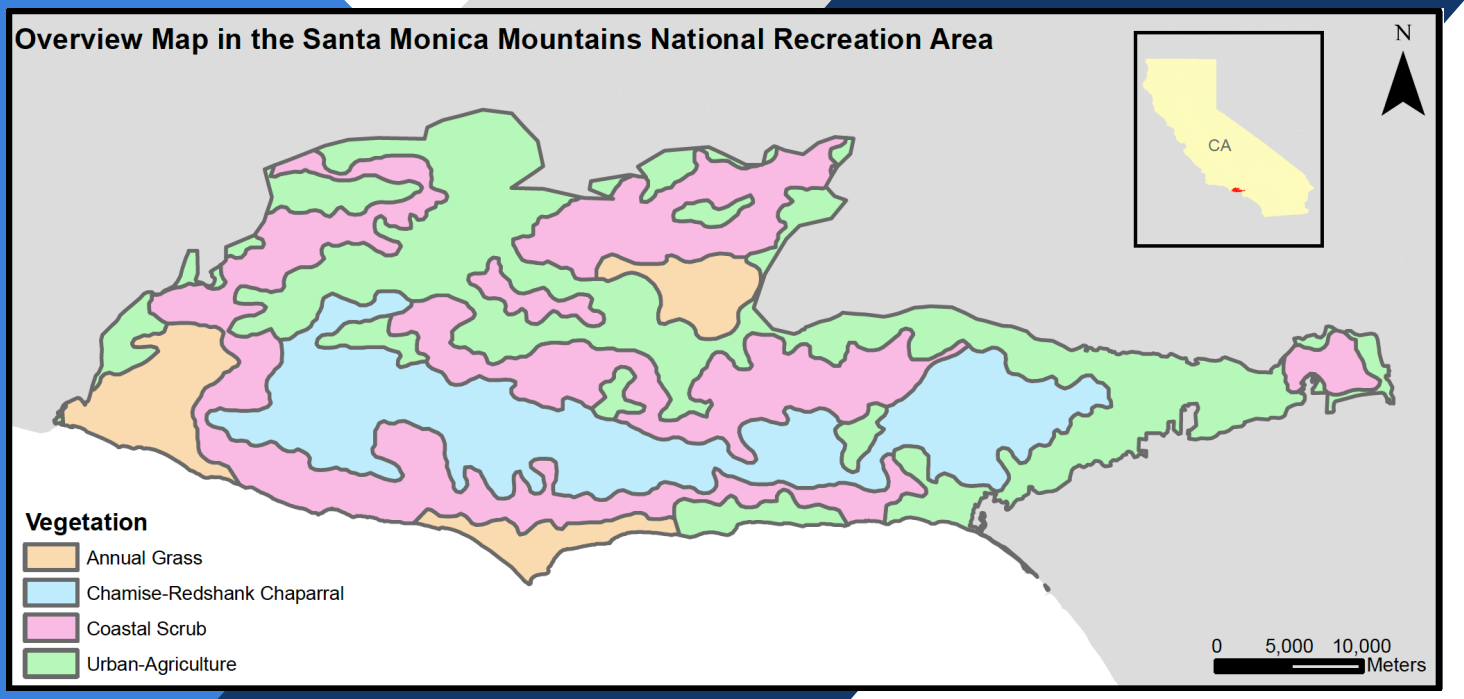

Terrain Analysis in SMMNRA Area

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Terrain Analysis in SMMNRA Area

Introduction

Santa Monica Mountains National Recreation Area (SMMNRA) possesses different terrains and is a significant recreation and nature area in the Southern California region. Based on map 9, there are four different vegetations distribute in the area. The vegetation habitats relate to several nature reasons include the effects of topography and solar radiation. Topography is the important factor that makes spatial differences of insolation. It is necessary to have terrain analysis to understand how topography and insolation shape the vegetation habitats in the SMMNRA.

Topography and Solar Insolation Are the Keys

The terrain analysis is the zonal analysis of each vegetation habitat. It is important to figure out what topography factors affect solar insolation and then make a table to compare the differences between these factors and solar insolation value in each vegetation habitat. Slope, aspect, and elevation are the important factors that influence the solar insolation that is helpful to the terrain analysis, so it is necessary to calculate the slope, aspect, and elevation based on the digital elevation model and then export the raster maps for further analysis. In addition, it is also significant to have the seasonal and annual solar insolation on the SMMNRA Area to know how the dynamic of insolation on the terrain then leads to the effects on vegetation habitats. For calculation of the seasonal solar insolation, it can choose four certain days in each season. Usually, the representative dates are the Spring Equinox, Summer Solstice, Autumnal Equinox, and Winter Solstice because of Solar Azimuth and Altitude calculation. After the calculation, there are several maps come out and with the statistics of solar radiation in W/m^2, and the calculation of the annual solar insolation is simple to calculate the average of the solar insolation of four seasons. Finally, the terrain analysis results will be based on the table of zonal statistics includes the statistics of elevation, slope, aspect, and solar radiation.

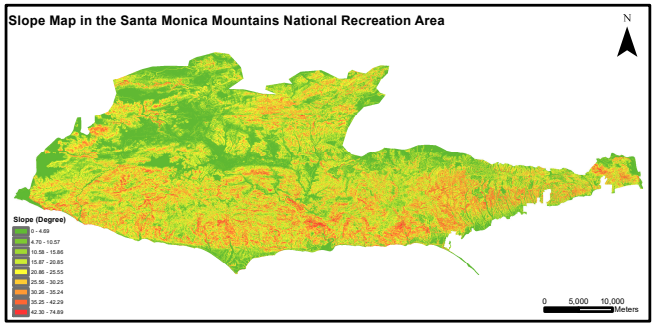
Spatial and Temporal Disparities

Based on the maps and table analysis, it is obvious that topography and solar radiation influence the distribution of vegetation habitats and shaped vegetation habitats in the SMMNRA Area. When comparing the slope, aspect, and elevation maps with solar insolation maps, the results indicate the relationship between topography and solar radiation. For example, when comparing map 1, map 2, map 3, and map 8, the comparison is between slope, aspect, elevation, and the annual solar insolation, and it is obvious that the shape of the distribution of annual solar insolation matches the shape of the distribution of slope, elevation, and aspect among these maps. Furthermore, according to the map 4, 5, 6, and 7, the results of all the seasonal insolation map show the pattern of the decline of solar insolation match the regularity of the climate change of each season; the maximum solar insolation exist in summer, and the minimum solar insolation exists in winter. The difference of solar insolation in different terrains and solar insolation have the dynamic change during a year; spatial and temporal disparities of the solar insolation make and shape the vegetation habitats in SMMNRA Area. Based on table 1, the zonal statistics clearly explain the distribution of some vegetation habitats in the SMMNRA Area due to the relationship between the terrain and solar radiation. From the table, the urban-agriculture possess the highest mean of solar radiation in Autumnal Equinox among these vegetations, and the urban-agriculture have the second-lowest mean of elevation, the lowest mean of the slope, and also the lowest means of aspect, which are showing the low elevation, the small degree of slope and aspect tend to have high solar radiation that shaped the vegetation and to make a suitable environment for urban-using or agriculture-using in SMMNRA Area.

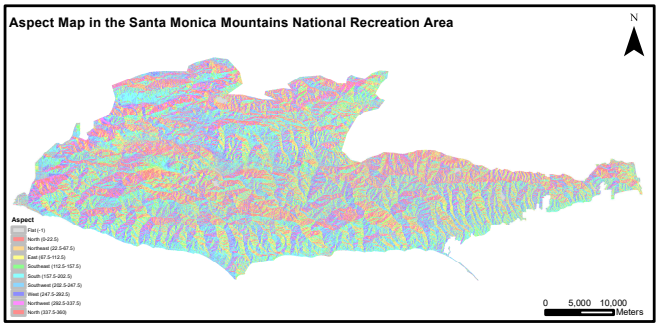
Conclusion

The terrain analysis shows the relationship between topography and solar insolation and how to shape the vegetation habitats in SMMNRA Area. From the analysis, spatial and temporal disparities of solar insolation cause the different distribution and kinds of vegetation habitats in SMMNRA Area.

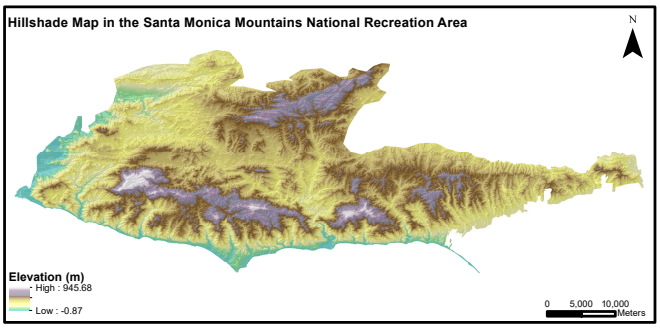
Appendix



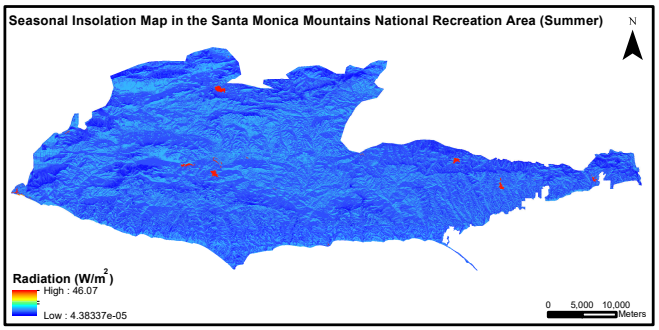
Map 1: Slope Map in the Santa Monica Mountains National Recreation Area



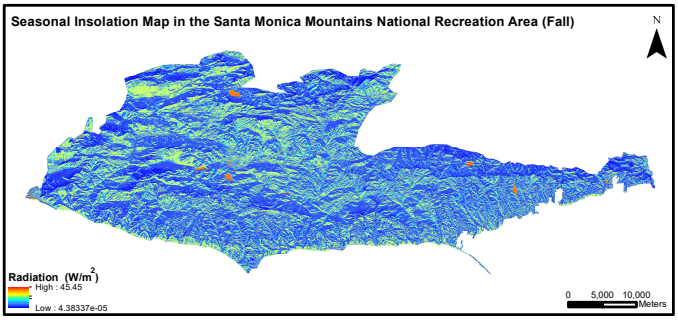
Map 2: Aspect Map in the Santa Monica Mountains National Recreation Area



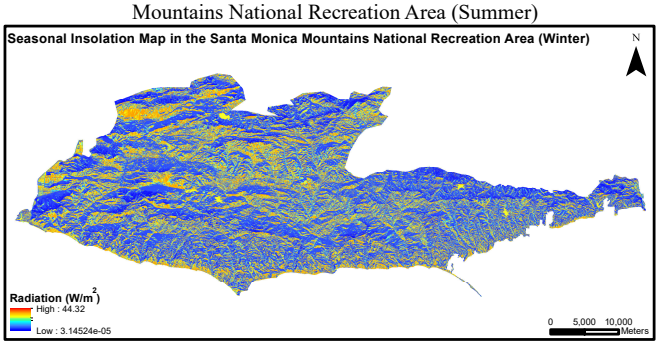
Map 3: Hillshade Map in the Santa Monica Mountains National Recreation Area



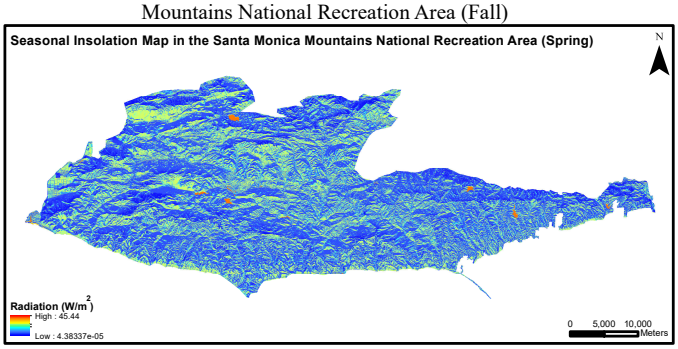
Map 4: Seasonal Insolation Map in the Santa Monica Mountains National Recreation Area (Summer)



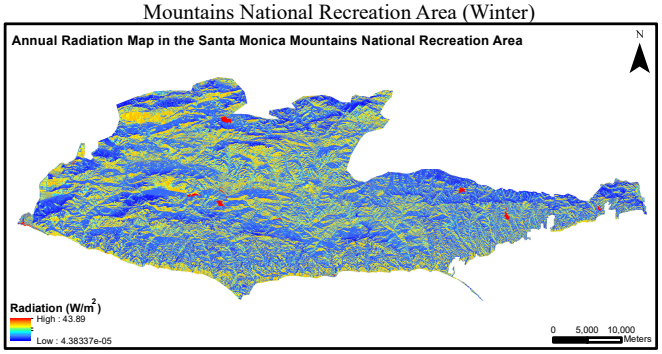
Map 5: Seasonal Insolation Map in the Santa Monica Mountains National Recreation Area (Fall)



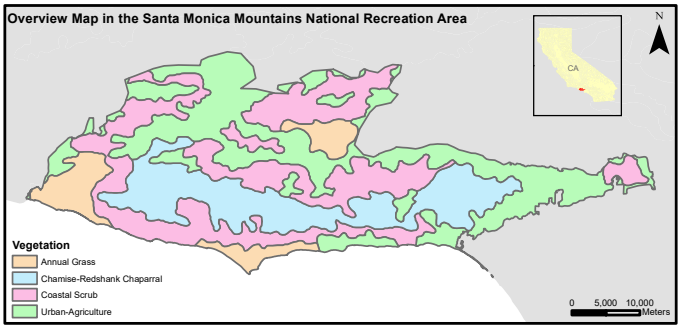
Map 6: Seasonal Insolation Map in the Santa Monica Mountains National Recreation Area (Winter)



Map 7: Seasonal Insolation Map in the Santa Monica Mountains National Recreation Area (Spring)



Map 8: Annual Radiation Map in the Santa Monica Mountains National Recreation Area



Map 9: Overview Map in the Santa Monica Mountains National Recreation Area

Table 1: Zonal Statistics

(Numbers are rounded to have 1 decimal place)

	Vegetation	Min	Max	Range	Mean
Elevation (m)	Urban-Agriculture	-0.3	685.8	686.1	258.6
	Coastal Scrub	0.1	758.1	758.0	335.2
	Annual Grass	-0.9	655.2	656.1	210.6
	Chamise-Redshank Chaparral	28.1	945.7	917.5	437.9
Slope	Urban-Agriculture	0.0	67.2	67.2	11.6
	Coastal Scrub	0.0	73.2	73.2	19.4
	Annual Grass	0.0	67.6	67.6	16.7
	Chamise-Redshank Chaparral	0.0	74.9	74.9	22.4
Aspect	Urban-Agriculture	-1.0	360.0	361.0	182.9
	Coastal Scrub	-1.0	360.0	361.0	185.0
	Annual Grass	-1.0	360.0	361.0	183.4
	Chamise-Redshank Chaparral	-1.0	360.0	361.0	176.8
Solar Radiation (W/m^2) (Autumnal Equinox)	Urban-Agriculture	0.0	45.4	45.4	11.6
	Coastal Scrub	0.0	45.4	45.4	10.3
	Annual Grass	0.0	43.2	43.2	11.5
	Chamise-Redshank Chaparral	0.0	45.5	45.5	9.7