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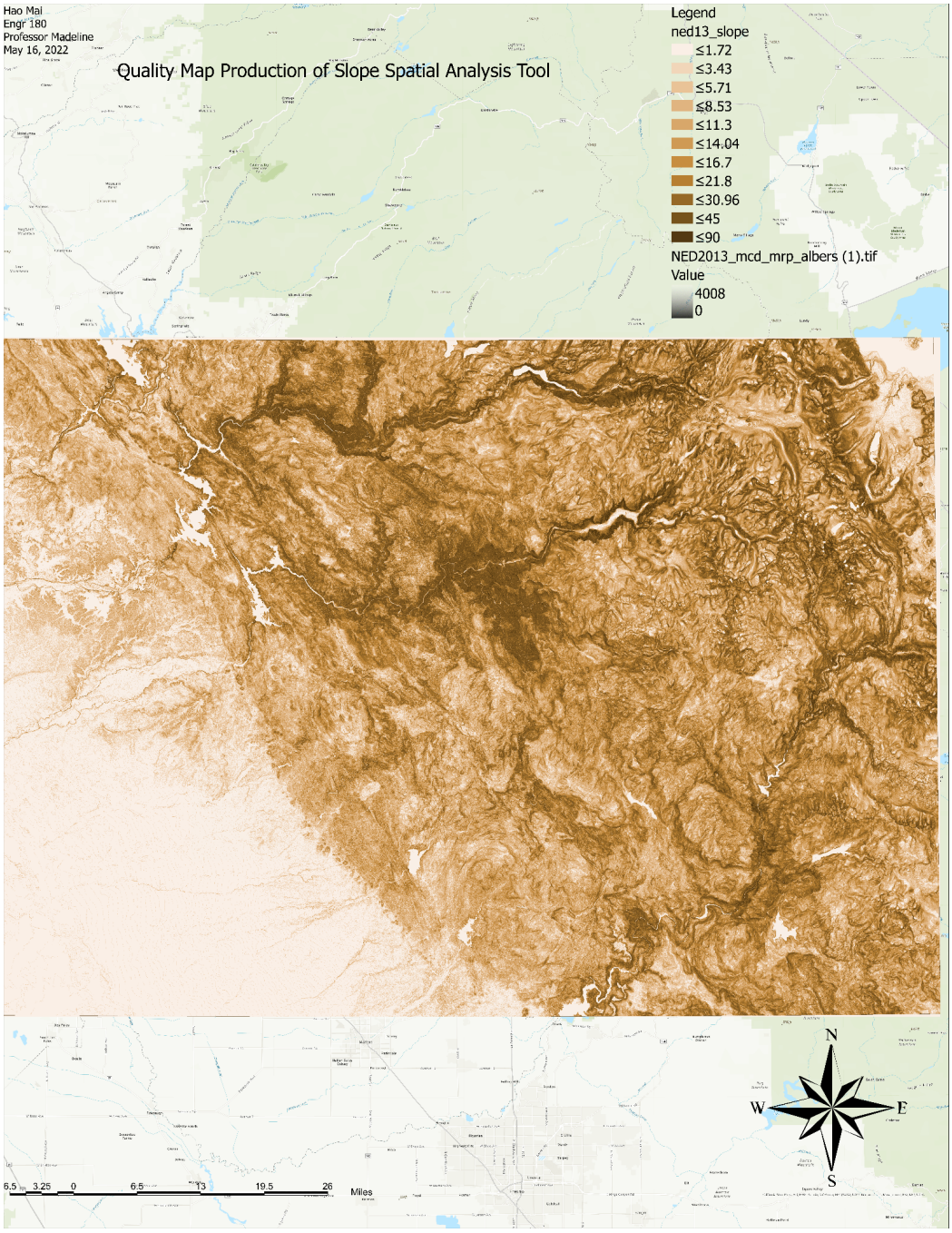
Engr 180
Professor Madeline Brown
Case study 3
May 16, 2022

"GIS for CalFire: Planning with Raster Data

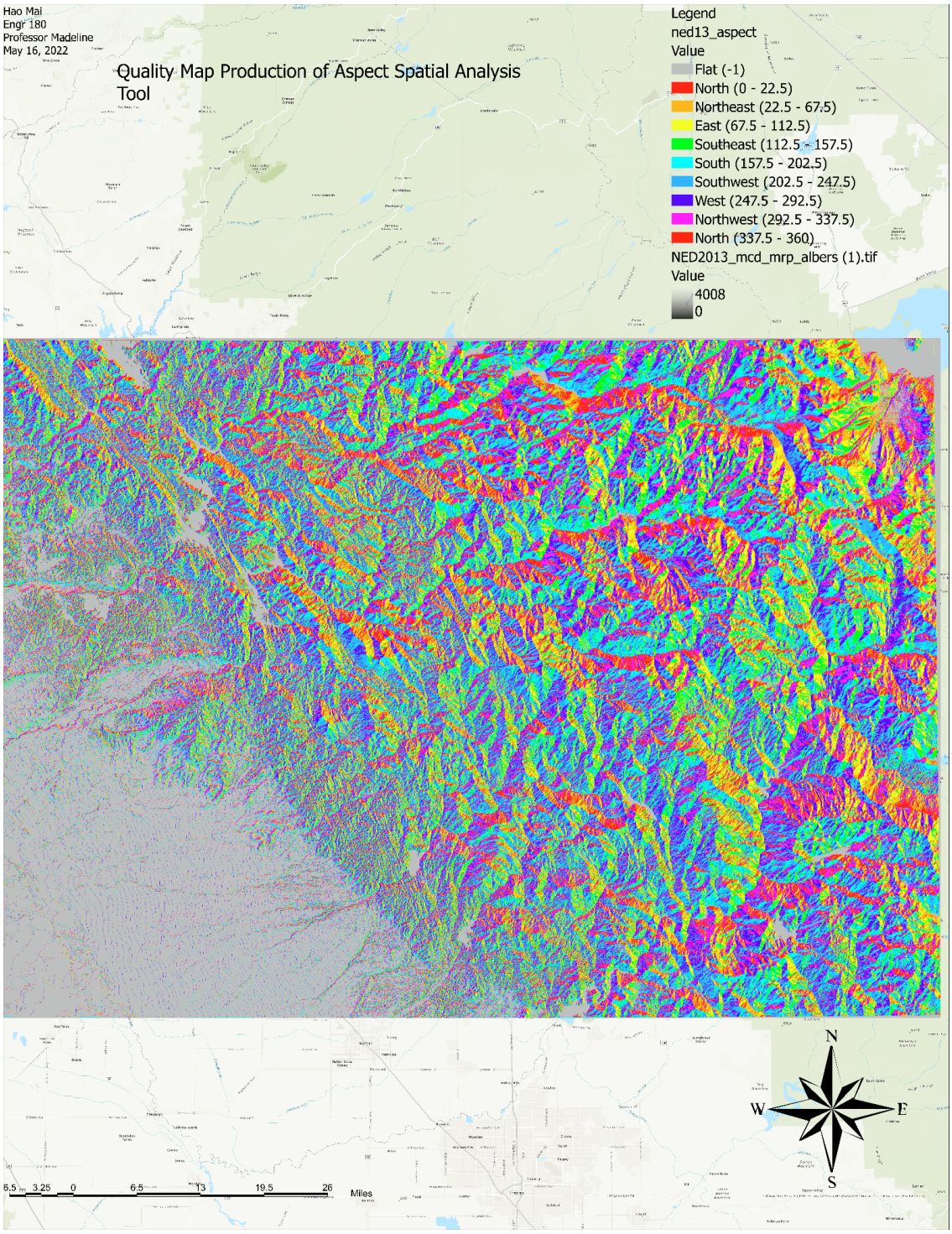
More on Raster Data Manipulation and Arcgis tools: Lab 4a

- Screenshot of quality map production for slope spatial analysis with raster data:



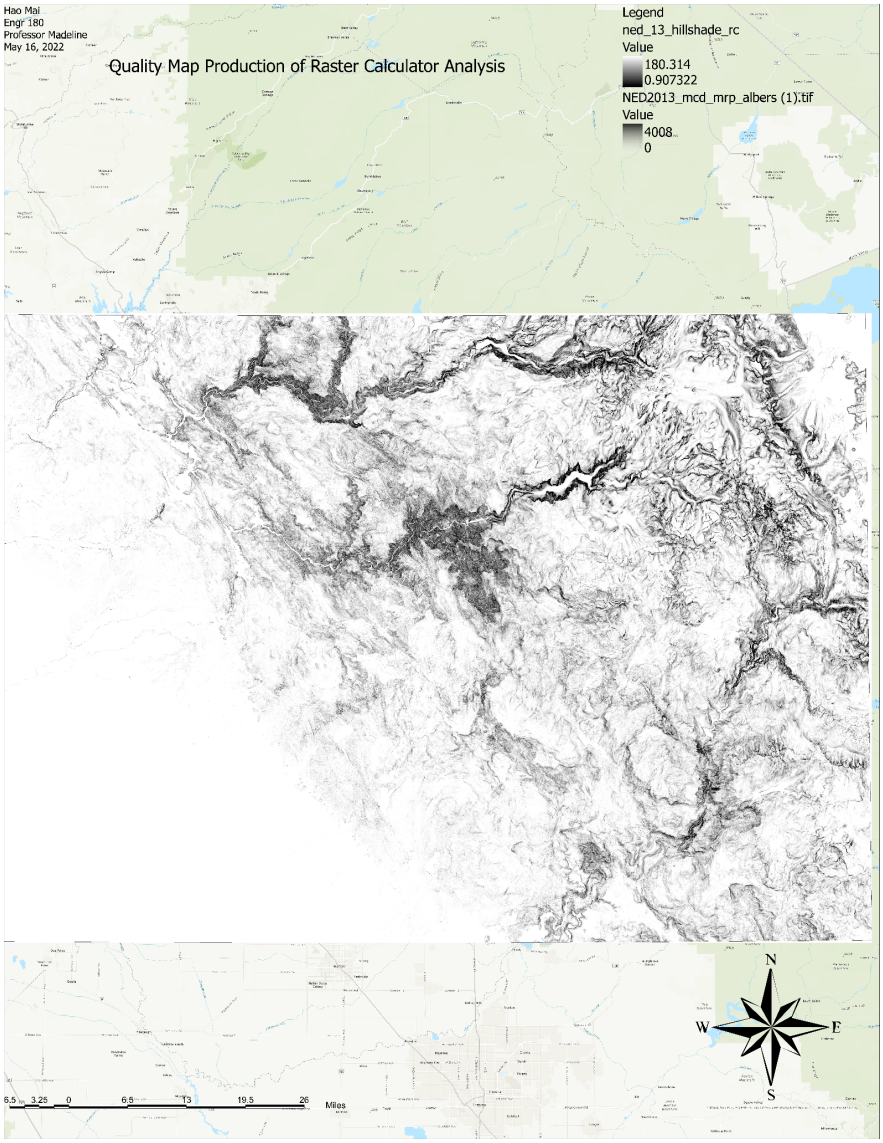
- The screenshot above depicts the manipulation of the spatial analysis tool within Arcgis. The methodology of this tool finds the derivative of cell value changes amongst the map collective data. By importing an image-based file, whereas in this lab a tiff image was employed, the tool analyzes a 3 by 3 cell table, by using map algebra as formula to predict the steepness or flatness of an area. More specifically, there is a math expression which can be employed to manually find out the slope of the map - dividing a raster map into table groups of 3 by 3 cells, find the rate of change along the x and y axis in according to the map algebra formula, take the quotients of the two axis and convert it into slope formula which is the summation of the quotients to the second power and then rooting the anwer, the last step is to convert it into degrees by find the arctan of the slope multiples by a given constant. Instead of doing all that, the picture above is computed by an algorithm which displays steep slope through dark symbology configuring and non-steep regions by lighter configuration scheme. Nonetheless, when looking at the map, one can identify where the valleys are represented by darker and narrowed traces within the map.

- Screenshot of quality map production for aspect spatial analysis tool within Arcgis:



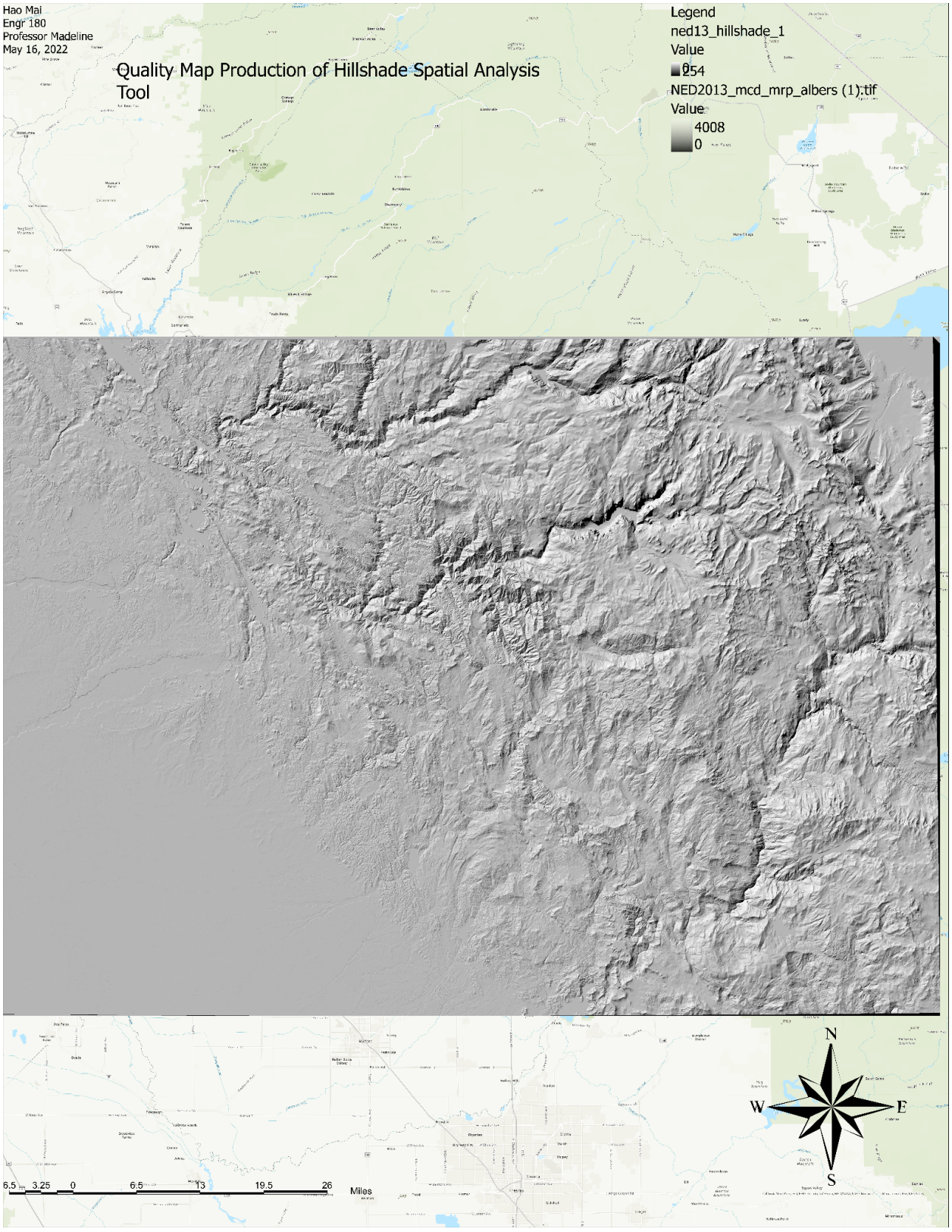
- The screenshot above is a product of importing a ‘.tif’ base map and analyzing it using the aspect spatial tool within Arcgis. The tool is designed to reflect the direction of which the slope of the base image is projected by the program. Alike to slope analysis, aspect analysis derived data configuration through computing neighboring cells to find the directions of the data to project onto the map; the cell tables input are the same, 3 by 3, and by analysis the data will allow the user to project the product through various resolutions. As seen within the exported map above, the projection is a contrast of the slope map; ergo, in this image, we can see the inclines and decline elevation amongst what seems to be a scatter plot. Through the legend, the user can infer what direction the slope is traveling as per mentioned above; furthermore, one can tell indefinitely where the mountain peaks are and the elevation of slopes which draw down to valleys.

- Screenshot of applying the raster calculator spatial analysis calculator:



- A relief map is akin to that of a traditional map in some aspects, but the main difference is that instead of contour lines identifying slope and aspects,it is represented by shaded areas across the cell which the value has been analyzed and reassigned to various variables. The calculation of default values contained within the cells are done by converting the values of the x and y axis, and the slope in the raster sets from degrees to radians with applications of various trigonometry operations. The output raster product would be a newly revised datatable containing newly assigned cell values and symbology. I would say that the image above represents a traditional relief map due to the method of data projection in which terrain routes and elevations are contained within the map .Though the map may be incomprehensible at first, but with reference to the legend, it can be read.

- Screenshot of Hillshade spatial analysis tool within ArcGis:



- The account for hillshade analysis tool within Arcgis takes into the consideration of the sun angle and the altitude of the sun in accordance to the time of day to project a interpolation of data to show the shadows component of regions within a map; in other words, cells sets are calculated to show the shadow estimate of its predecessor cells. The objective is to compile a relief map representation of the raster data. As presented above, the screenshot depicts a relief projection of the 'NED2013_mcd_mrp_albers (1).tif' base image. As presented within the map projection, the plan gray area represents flat lands, and as the rigid lines become more apparent, there it shows clear protrals of elevation points and steepness in contrast to the shadow present within the valleys between the rigid demonstration.

- Ethical discretion in communication of GIS information delivery projects

Dear Project's Strike Commander and to whom it may concern,

The compilation of exported maps above are created through the application of ArcGis software. The tools of the programs that were employed to render these exports are the slope spatial analysis tool, aspect spatial analysis tool, reconfiguration raster data to display a relief map through Arc's terminal, and hillshade spatial analysis tool. These tools are applied to a base map of the central valley; more specifically, the San Joaquin county. The above exports may be used for the purpose of terrain analysis in regard to elevation and hillshade of the terrain. As displayed in the data and map above, the slope as projected is the reconfiguration of input raster data through mateicallical formula deviation of the x and y axis to find the degree of the presented within the map. The aspect tool refines the perspective of the map by giving it another perspective - contrast to slope, the aspect map delivers the direction of which the slope is facing. Thereby, as slope dedicates peaks and steepness base to darker coloring schemes which can be a bit misleading without the legend, aspect conceived a three-dimension like projection which delivers a more vivid illustration of the map scheme. Also, the raster calculator is a projection layer derived from a mathematical algorithm which employs trigonometry to convert the cells table values from degrees into radian and the product will be a relief map of the central valley. The last tool used within this map is the hill shade spatial analysis tool. The objective of this tool is to create shows of regions within the map by analyzing and reassigning the values of negative and positive numbers within the data to specific color across the map layout. Before considering these exports consider that the details are limited and the quality can be revised to be better in terms of more data input and different methods of projections to user's reference. Nonetheless, these exports may present valuable information to the reader as per the slope data, the aspect data and hillshade data are all available to the user with provided legend. Which may all aid in the project of structural development and route mapping within the central valley of California. The composition of these exports were made on the date of May 17, 2022. Any inquiry or concerns may be directed to me at my school email: hmai5@ucmerced.edu .

Sincerely,

Hao DInh Mai

Work Citation:

- “Help_Slope ArcGIS.” *How Slope Works-Help | ArcGIS for Desktop*, https://desktop.arcgis.com/en/arcmap/10.3/tools/spatial-analyst-toolbox/how-slope-works.htm.
- “ArcGIS Online.” *Cloud-Based GIS Mapping Software Solution*, https://www.esri.com/en-us/landing-page/product/2019/arcgis-online/overview?adumkts=product&adupro=ArcGIS_Online&aduc=advertising&adum=ppc&adusf=google&utm_Source=advertising&aduca=arcgis_online_promotions_demandgen&aduco=DPM_OLP_Analysis_BottomFunnel&adut=DPM_PPCNonBrand_BottomFunnel&aduat=contact_request&adupt=lead_gen&sf_id=7015x000000iT8WAAU&ef_id=%3AG%3As&s_kwcid=AL%218948%213%21%21p%21%21o%21%21gis+software&_bk=gis+software&_bt=&_bm=p&_bn=o&_bg=1296324440594785&gclid=677bc258ce811ea6d23fa0f609f1ddb4&gclsrc=3p.ds&msclkid=677bc258ce811ea6d23fa0f609f1ddb4&utm_source=bing&utm_medium=cpc&utm_campaign=DPM+ArcGIS+Online+2020+-+NB+-+Phrase&utm_term=gis+software&utm_content=Bottom+Funnel+-+Online+GIS.
- Brown, Madeline. *GIS for CalFire: Planning with Raster Data* https://catcourses.ucmerced.edu.
- “Aspect (Spatial Analyst).” *Aspect (Spatial Analyst)-ArcGIS Pro | Documentation*, https://pro.arcgis.com/en/pro-app/latest/tool-reference/spatial-analyst/aspect.htm.