The Best Climbing Places in the Yosemite Valley, determined using LIDAR

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Model Builder

What have I done until now?

I have found on OpenTopography a point cloud dataset named 'Yosemite National Park, CA: Rockfall Studies'(2010), located in the grounds of the Yosemite National Park, specifically the Half Dome and the Yosemite Valley.

Because I wanted to find the best climbing places in the Yosemite Valley, and this area didn't cover El Capitan, the highest wall in the Valley, I have searched for more data. I have added two more point cloud datasets from OpenTopography, 'Yosemite, CA: El Portal, Mariposa Grove, Yosemite Canyon & Tuolumne Meadows'(2006) and 'Airborne Laser Mapping of Yosemite National Park, CA, 2007' to cover El Capitan and a portion of Little Yosemite Valley.

First, I set the extent of the study area by transforming the merged point clouds in polygons, shrinking and cleaning the inner holes.
Then I had to decide whether I would create a raster from a LAS Dataset or I would create and use a Terrain Dataset for this. I tried both, and kept only the second solution, because using Terrain datasets we can process and view faster the LAS data, and see derived layers like slope, aspect and so on. They are spatially indexed and pyramided into multiple levels of detail. The creation of a raster from a Terrain dataset assures a smoother derived slope raster, too.

So, I have created a new file geodatabase, added a new file dataset inside it, transformed the LAS files to multipoint file, imported this file in the new dataset together with the previously created extent polygon. Then I created a Terrain from the Masspoints using the Extent file as a soft border (to exclude all the values outside the area).
I've transformed the Terrain file to Raster using Nearest Neighbour interpolation, a Cellsize of 2, and piramids at 0 (maximum resolution).
Then I ran slope on the resulting raster, using Percent instead of Degree.

In parallel, I have prepared the data for the Yosemite Park taken from IRMA datastore. I have created a file geodatabase, park_data.gdb, where I've imported the useful files. Then, I have creted another file geodatabase, valley_data.gdb and used Feature class iterators to iterate through all the files in park_data.gdb, clipped them with the Extent polygon, and saved them in the new geodatabase.

What do I still have to do?

I want to create a Weighted Overlay process to weight the importance of streams, trails, roads, springs, parking areas, rockfall hazard line, and slope, in finding the most suitable climbing areas for a tourist. I began by creating Euclidean Distance models for each of the above factors. Then I would reclassify the resulting rasters, and weight and combine the datasets. The result would be a raster containing the climbing areas.

I still have to find a way to better delineate the climbing walls, maybe instead of using plain slope, I will use a spherical standard deviation method to find regions or zones where the slope varies little, and use reclassify to derive more compact polygons.

Also, I have to make more tests to assess how the overlapping point clouds areas would affect the resulting elevation model. If necessary, I will use LAS Overlap on a LAS dataset to solve this issue. Or maybe try LAS tiling.

I have tried to use a Mosaic dataset to host the point cloud files, too. I have to choose whether to use the Terrain dataset approach, a Mosaic dataset approach or a simple LAS dataset. I guess the Terrain is the most useful for performance.