

To: Dianne McDonnell

CC:

From: Isaac Taylor

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Subject: Final Project

Final Project – Initial Planning and Preparations

The pages that follow include information regarding the planning and preparation phases of the final project. Please contact Isaac Taylor at (816) 797-3648 or at zrt23@nau.edu if any questions arise.

Attached: Assignment 5, Exercise 7 Practice File – Heads-up Digitizing

This final project will identify the suitability of a region for the placement of photovoltaic (PV) energy production. By using the “Solar Radiation” toolset within the Spatial Analyst toolbox, the insolation across the landscape can be calculated or the specific radiation energy at a given location can be found [1]. Utilizing these will provide quantitative data to determine the theoretical suitability of the selected/tested region. In addition to this, a graphics tool (provided within the toolset as well) allows for visual representations of the region and its PV qualities to be presented [1]. This toolset works alongside others within the Spatial Analyst toolbox to analyze raster data for the region to determine 4 characteristics of a suitable location. A University of Arizona study concluded the need for consideration of: elevation, aspect (direction), slope, and radiation properties [2]. The end goal for this project is to gain an understanding of the geographical needs for optimum PV solar production and develop the skills to plan for alternative energy sources on my own future properties and facilities.

The most important data necessary to complete this project will be a raster file to run the analyst toolsets with. This DEM file must be high resolution and will be raster clipped down to a precise location to avoid excessive processing times. To form the graphic display, all locations must be inputted via a geodatabase file (.dbf) or text table file [3].

Data will be collected mainly from the [NRCS Get Data](#) hub for land data. Another resource for soil data will be the [Web Soil Survey](#). Satellite imagery will be georeferenced into ArcMap via Google Earth using online tools as a guide to provide the correct settings [4].

Once all the necessary files have been identified and processed, the files will be first projected into UST NAD 84 12N to standardize the data received. A customized boundary will be identified and created using heads-up digitizing to form manually laid polylines. These lines will then be used to begin raster clips and query driven isolations to minimize the amounts of bulky data “hanging out” in the files. With this reduced, processing times will shorten, and file sizes will also be reduced. The surface analysis will begin after the settings have been prepared, followed by a satellite base map, then a graphical representation. A general outline of the steps to be followed has been provided below:

- 1) Import files
 - a) Project to UST NAD 84 12N
- 2) Define and digitize location boundary
 - a) Clip raster files to boundary
 - b) Isolate non-raster files to boundary
- 3) Initial surface analysis
 - a) Slope analysis
 - i) Classify analysis on a binary scale
 - b) Elevation analysis
 - i) Classify on a binary scale
- 4) Solar Radiation analysis
 - a) Area solar radiation
 - i) Units: W-h/m²
 - ii) *May be very time consuming – consider completing sooner in the process*
 - b) Solar radiation graphics

- i) Recommended day interval: > 3
 - ii) Minimum sky value: 200 (default)
 - iii) Output
 - (1) No GCS
 - (2) Square
- 5) Satellite references
 - a) Import Google Earth data
 - b) Location map and geographical depiction
- 6) Prepare layouts
- 7) Develop presentation

All steps during this process will be recorded digitally or by hand and each key step will be cataloged with a screenshot and saved with a known path file to relocate as needed.

The final product will be both maps and graphics. A surface map relating the slope and elevation properties of the location will be provided along with a digital base map related to the current vegetation and groundcover. In addition to this, a 3D graphical view of the suitability of different areas of the location will be provided. Lastly, a presentation will be prepared to explain both the process and the results of the project.

References

- [1] Environmental Systems Research Institute, "An overview of the Solar Radiation toolset," Environmental Systems Research Institute, 2018. [Online]. Available: <http://desktop.arcgis.com/en/arcmap/latest/tools/spatial-analyst-toolbox/an-overview-of-the-solar-radiation-tools.htm>. [Accessed 15 11 2018].
- [2] A. Chaves and T. A. Bahill, "Locating Sites for Photovoltaic Solar Panels," University of Arizona, Tuscon, 2010.
- [3] Environmental Systems Research Institute, "Solar Radiation Graphics," Environmental Systems Research Institute, 2018. [Online]. Available: <http://desktop.arcgis.com/en/arcmap/latest/tools/spatial-analyst-toolbox/solar-radiation-graphics.htm>. [Accessed 11 15 2018].
- [4] Y. Kawano, "Introductin to GIS," University of California Los Angeles, n.d.. [Online]. Available: <http://gis.yohman.com/up206a/how-tos/how-to-add-a-google-earth-satellite-image-into-arcmap/>. [Accessed 15 11 2018].