Utah County NDVI Classification

Lab #2 Normalized Difference Vegetation Index (NDVI)
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9/9/2022
CE414

The purpose of this assignment was to locate irrigated and non-irrigated cropland in Utah County. This was done by creating a model to calculate the NDVI (Normalized Difference Vegetation Index) using the RED and NIR Bands from Landsat imagery of the area. To do this I used a variety of tools in model builder, such as Float, Minus, Plus, Divide, and Reclassify. Using these tools I was able to calculate the NDVI and identify irrigated and non-irrigated cropland in Utah County.

Model

Tools used in the model and settings applied to each one:

- Float:
    - Input raster: NIR [Band 40] and RED [Band 30]
    - Output raster: NIR Float and RED Float
- Minus:
    - Input raster or constant value 1: NIR Float
    - Input raster or constant value 2: RED Float
    - Output raster: NDVI NUMERATOR
- Plus:
    - Input raster or constant value 1: RED Float
    - Input raster or constant value 2: NIR Float
    - Output raster: NDVI DENOMINATOR
- Divide:
    - Input raster or constant value 1: NDVI NUMERATOR
    - Input raster or constant value 2: NDVI DENOMINATOR
    - Output raster: NDVI Values
- Reclassify:
    - Input raster: NDVI Values
    - Reclass field: VALUE
    - Start: -1, 0.4, NODATA
    - End: 0.4, 1, NODATA
    - New: 1, 2, NODATA
    - Output raster: Reclass NDVI

Inputs:

- NIR Band 40: This is a raster dataset from a Landsat image of Utah County.
- RED Band 30: This is a raster dataset from a Landsat image of Utah County

Intermediate:

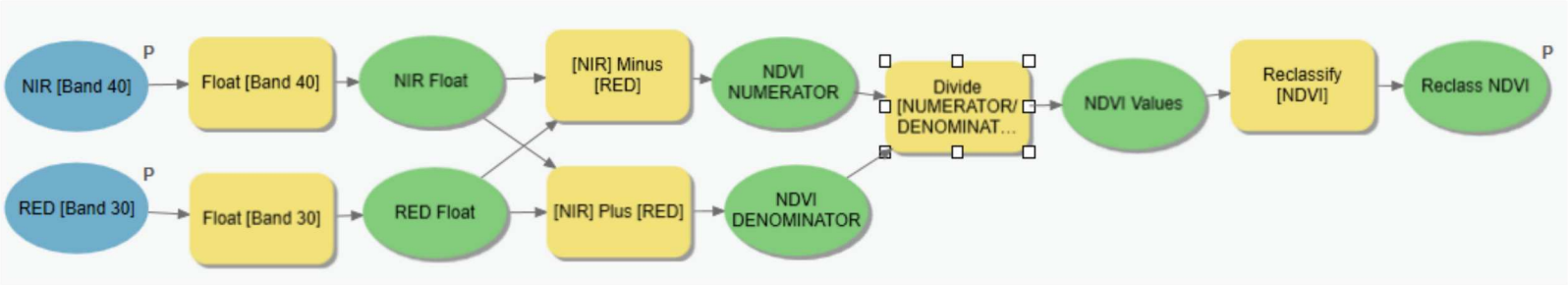
- NIR Float
- RED Float
- NDVI NUMERATOR
- NDVI DENOMINATOR
- NDVI Values

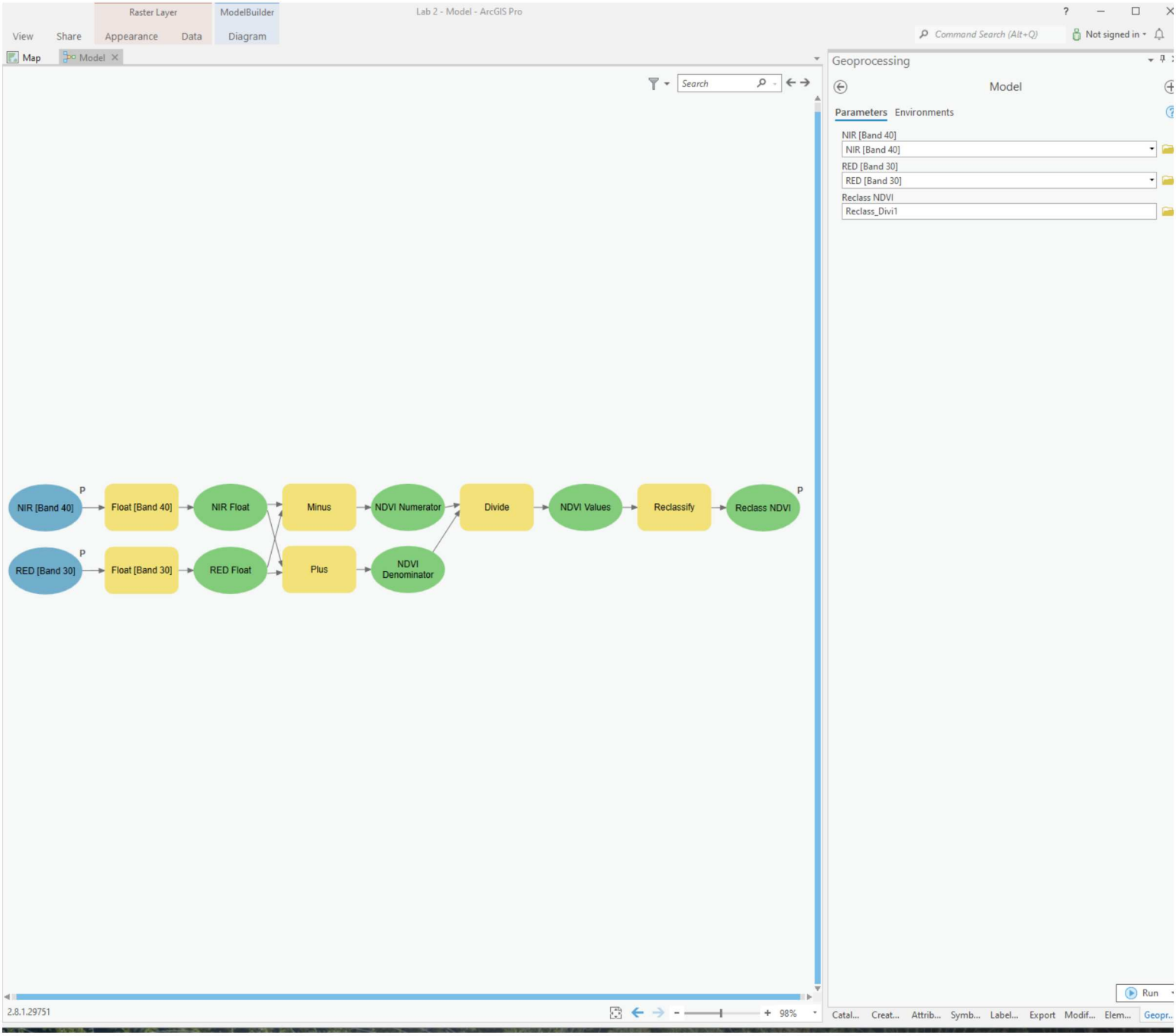
Output:

- Reclass NDVI: This is a raster dataset that was created from NIR and RED raster datasets from Landsat imagery. We converted these original raster inputs to Float data, used the Minus, Plus, and Divide tools to calculate NDVI, then reclassified the NDVI data to represent non-irrigated and irrigated cropland in Utah County. This Reclass NDVI is that result.

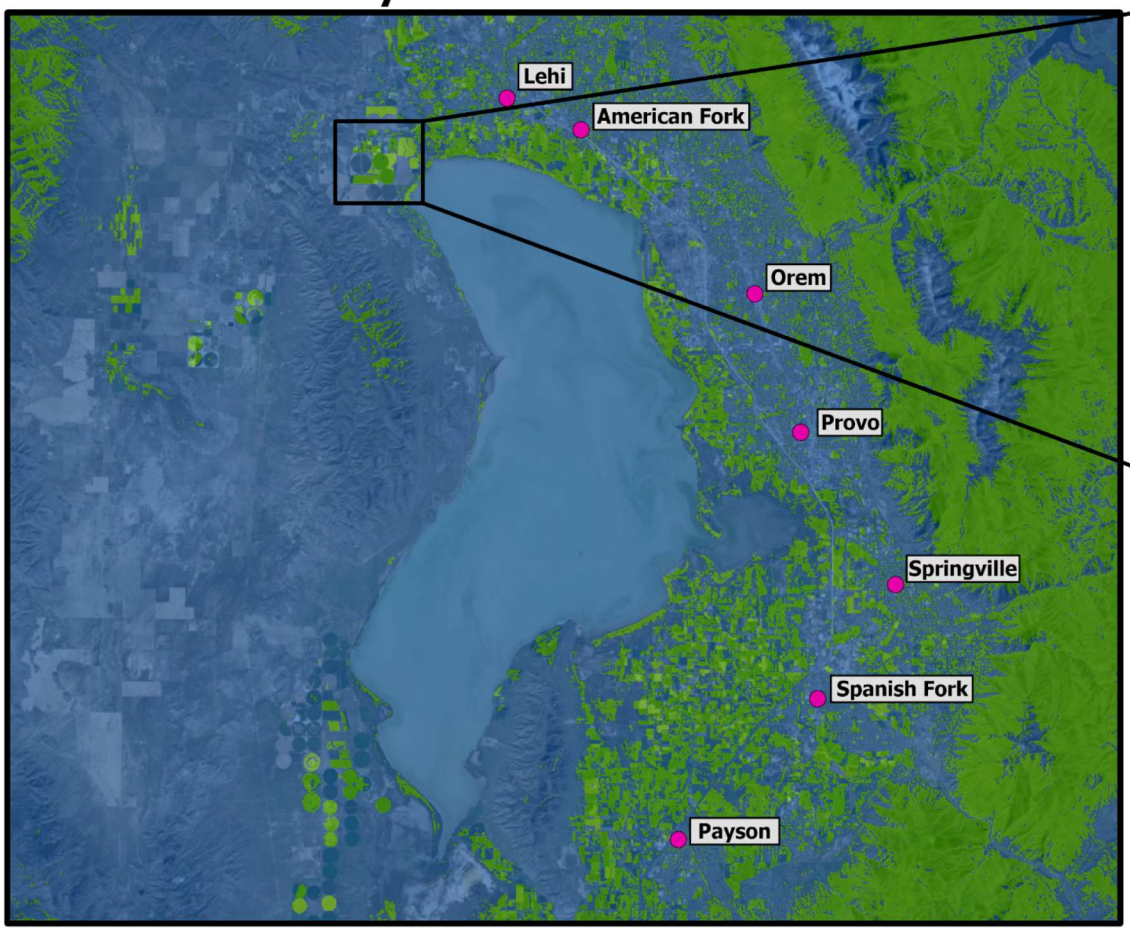
What locations within Utah County are most irrigated?

- The most center-pivot irrigated areas of Utah County are SW of Utah Lake, as well as NW of Utah Lake near Saratoga Springs. There is a lot more open space with less development, which makes sense why the larger, center-pivot irrigation systems are here. Other types of irrigation are most prevalent around the lake on the east side and in the more southern part of the county. Irrigation is probably easier in these areas with a shallower water table and smaller population density. This was generally what I expected for the irrigation in Utah County going into this lab.

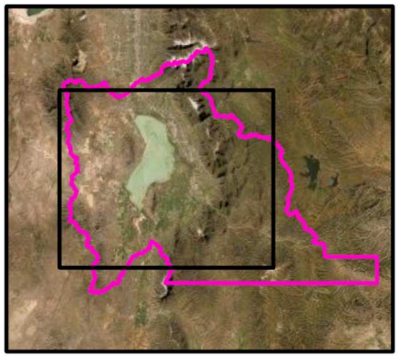

NIR [Band 40]
P
Float [Band 40]
NIR Float
[NIR] Minus [RED]
NDVI NUMERATOR
Divide [NUMERATOR/ DENOMINAT...
NDVI Values
Reclassify [NDVI]
Reclass NDVI
P
RED [Band 30]
P
Float [Band 30]
RED Float
[NIR] Plus [RED]
NDVI DENOMINATOR


Raster Layer
ModelBuilder
Lab 2 - Model - ArcGIS Pro
View
Share
Appearance
Data
Diagram
Command Search (Alt+Q)
Not signed in
Map
Model
Search
Geoprocessing
Model
Parameters
Environments
NIR [Band 40]
NIR [Band 40]
RED [Band 30]
RED [Band 30]
Reclass NDVI
Reclass_Divi1
NIR [Band 40]
P
Float [Band 40]
NIR Float
Minus
NDVI Numerator
Divide
NDVI Values
Reclassify
Reclass NDVI
P
RED [Band 30]
P
Float [Band 30]
RED Float
Plus
NDVI Denominator
Run
2.8.1.29751
98%
Catal...
Creat...
Attrib...
Symb...
Label...
Export
Modif...
Elem...
Geopr...

Utah County NDVI Classification



Center-Pivot Irrigation Area



0 2.5 5 7.5 10 Miles

N

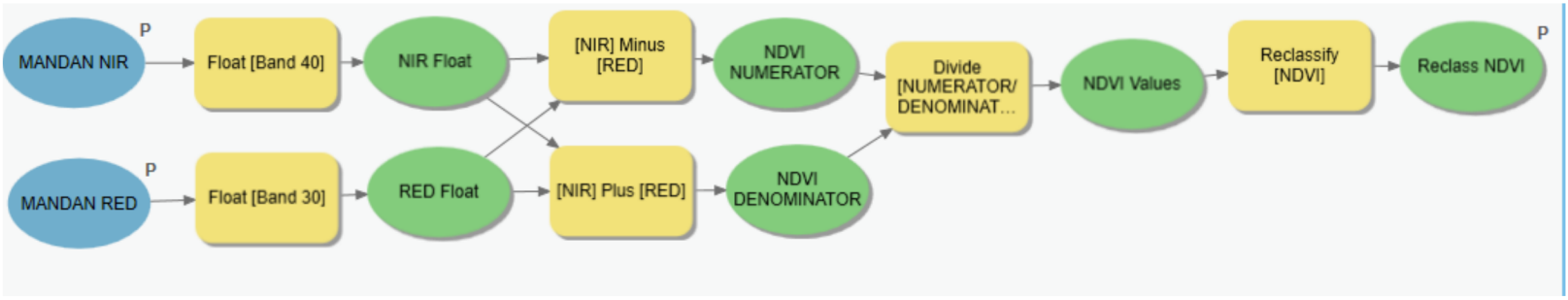
- Non-Irrigated Cropland
- Irrigated Cropland
- Utah County
- Utah County Cities

NDVI Lab
9/9/2022
NAD 1983 UTM Zone 12N

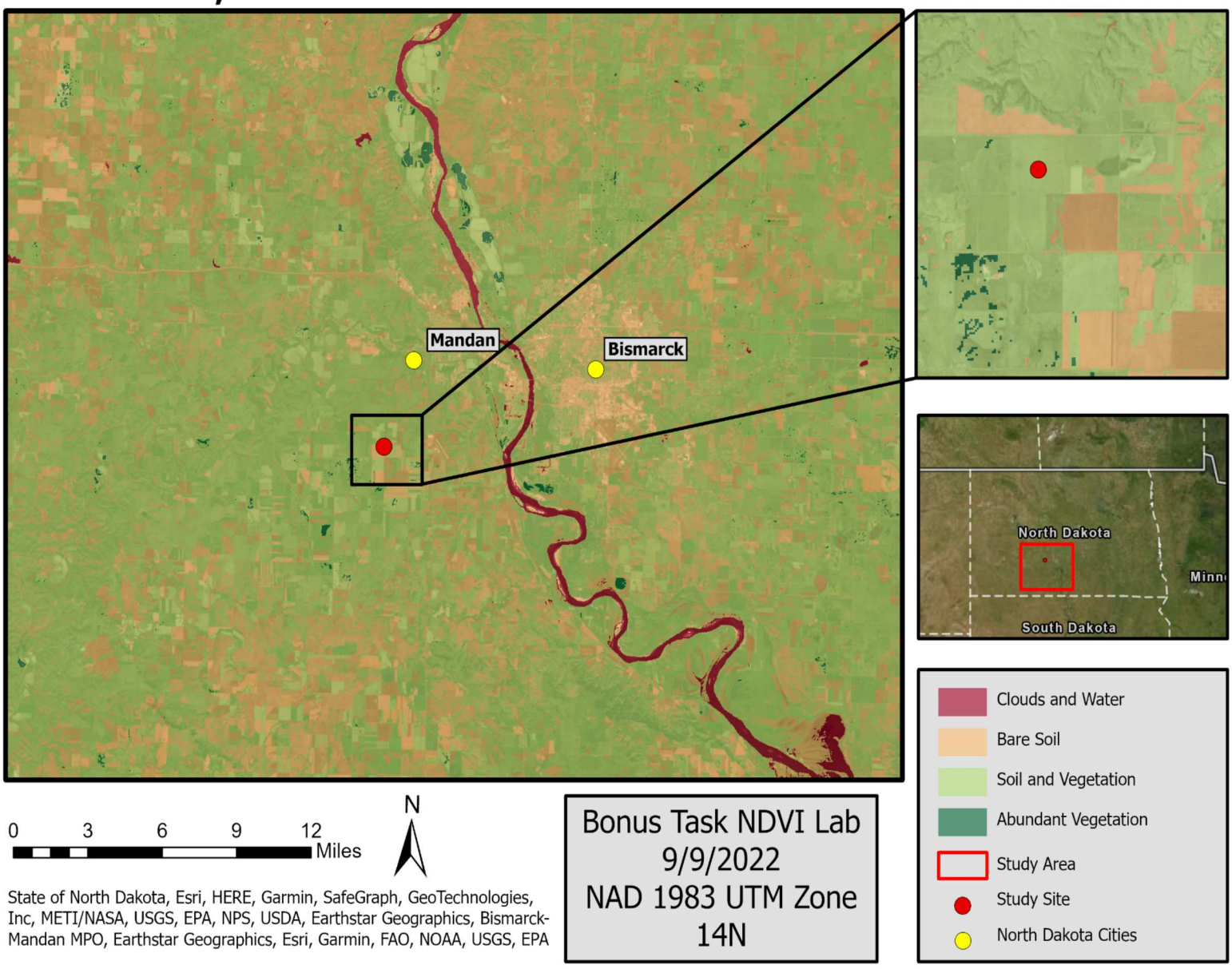
Earthstar Geographics

Bonus Task

For the bonus task I used Landsat 8 imagery taken Summer 2018 over the Mandan, North Dakota area. This was acquired from the USGS Earth Explorer application. This is one of 10 areas that I'm studying for my thesis, specifically looking at dust sources. Understanding which areas are bare soil, heavily vegetated, or a mixture of the two will be helpful for me in identifying potential dust source areas. For the model I simply changed the parameters in the Toolbox Interface for my model, adding the NIR and RED band data for Mandan, ND instead of Utah County. I also changed the Reclassify scheme, setting NDVI -1-0 as Clouds and Water, 0-0.2 as Bare Soil, 0.2-0.5 as Soil and Vegetation Mixture, and 0.5-1 as Abundant Vegetation. The resulting map gives me a better idea of dust source areas in Summer 2018 when my samples were collected.



Mandan, ND NDVI Classification



0 3 6 9 12 Miles

N

State of North Dakota, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, Earthstar Geographics, Bismarck-Mandan MPO, Earthstar Geographics, Esri, Garmin, FAO, NOAA, USGS, EPA

Bonus Task NDVI Lab
9/9/2022
NAD 1983 UTM Zone 14N

Rubric for Classifying Land based on the NDVI

Item	**Points** **50/50**
Assignment Title, Name, Date, Course	1/1
Brief report on the requirements of the project	5/5
Describe your model · List each of the tools used: (1 pt.) · List tool settings applied for the analysis (could someone repeat the lab using your report?): (1 pt.) · List all input, intermediate, and output datasets: (1 pt.) · Describe each input dataset including type (point, line, polygon, raster) and the source of the data: (1 pt.) · Describe each output dataset (point, line, polygon, raster): (1 pt.)	5/5
· One or more full pages (8.5 x 11) showing your model (5 pts.) · All text is readable (10pt. font minimum) (2 pts.) · All tools and data sets are shown (2 pts.)	9/9
· What locations within Utah County are most irrigated? (3 pts.) · Are your results as expected or did you find anything interesting or different than expected? (2 pts.)	5/5

Make a full page (8.5 x 11) map showing the results of your NDVI classification for Utah County. · Map Title: (1 pt.) · Neat Line: (1 pt.) · North Arrow: (1 pt.) · Scale Bar: (1 pt.) · Text box with author name, date, map projection: (1 pt.) · NDVI classification image: (5 pts.) · Irrigated land versus non-irrigated land clearly symbolized: (1 pt.) · Polygon of Utah County: (1 pt.) · Labeled points indicating locations of a few large cities: (1 pt.) · Zoomed to an appropriate scale for viewing analysis results: (1 pt.) · All text is legible on printed map: (1 pt.)	15/15
· Create a Toolbox Interface for your model and include a screen capture of it including input and output data parameters.	10/10
Bonus Task: Repeat the lab exercise with a different dataset. Incl eport what data you used, how you acquired it, ve changed to complete the exercise. Include nap showing your results.	Instructor's Discretion I did the bonus task!