GEOGRAPHY 182A: Remote Sensing

LAB 3: Temporal Vegetation Analysis with Fire

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1. Use the statistics tool to report mean, minimum, maximum, and standard deviation for each of your four NDVIs. Round the values to the nearest hundredth.

Date	Mean	Minimum	Maximum	SD
August 15, 2013	0.30	-0.13	0.59	0.10
September 16, 2013	0.17	-0.10	0.57	0.10
August 18, 2014	0.23	-0.13	0.58	0.09
August 21, 2015	0.23	-0.11	0.57	0.08
September 27, 2017	0.23	-0.13	0.56	0.08

2. What is the theoretical data range of an NDVI image (i.e. minimum and maximum values)? What is the data range of your NDVI images? Does this data range make sense (refer to the NDVI formula above)?

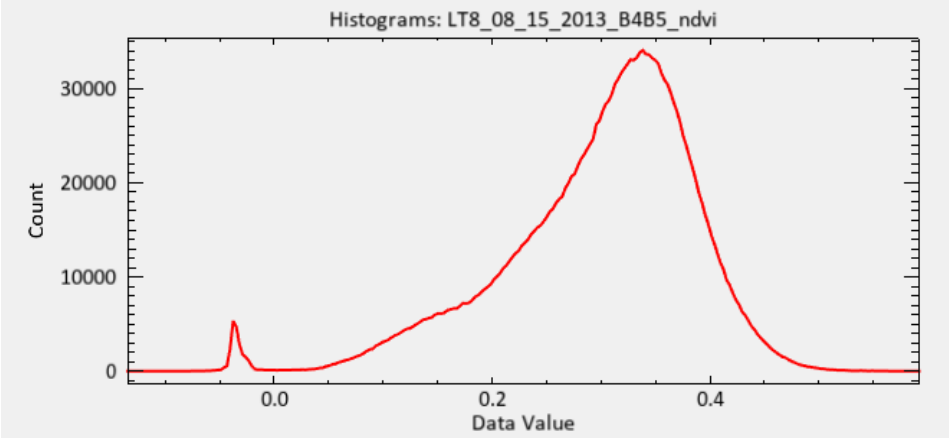
Theoretically, NDVI values may range from -1.0 to 1.0. In actuality, across all five NDVI images here the values range from -0.13 to 0.59. This makes sense as sparse vegetation generally ranges in NDVI value from ~0.2-0.5, meaning these values are consistent with the vegetation of the area. In terms of the NDVI formula, these values are due to the fact that vegetation is more strongly reflected in the NIR band, while soil is more strongly reflected in the Red band. Since the Red band is subtracted from NIR, areas with less vegetation and more soil will result in a smaller value, while areas with more vegetation will have a larger value.

3. Report your mean NDVI values for the before and after images. Explain the response of the vegetation to the fire (e.g. initial response, subsequent regrowth) and provide your graph below.

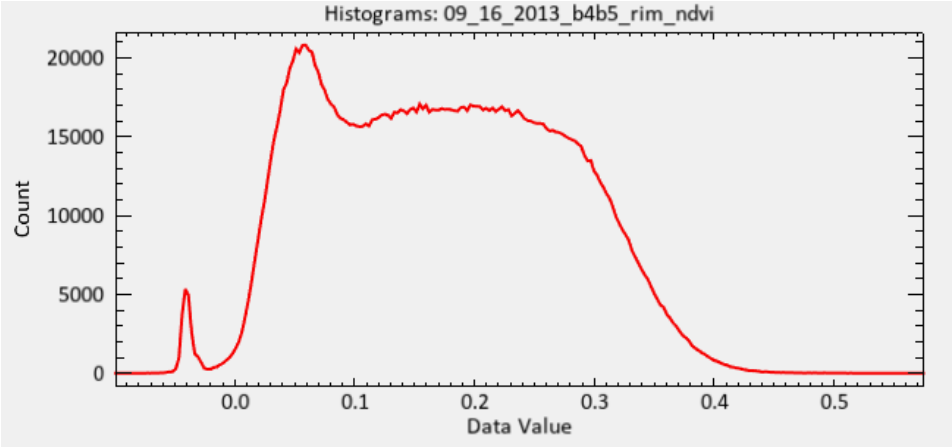
The imagery provided before the Rim Fire is from 08/15/2013. For this date, the mean NDVI value is 0.30. After the fire, on 09/16/2013, the mean NDVI value drops to 0.17. This is due to the fact that most of the vegetation in the area was burned by the Rim Fire, dropping the value. As the years pass, the vegetation in the area regrows and the mean eventually stablizes at 0.23. This is notably significantly lower than the original pre-fire mean, indicating that the vegetation in the area has not regrown to the same extent it covered before the fire.

The shift and regrowth in vegetation is visible in the following graphs. They show the distribution of NDVI Values for each given year. Graphs are labeled with LT8 Date, as well as the corresponding stage of fire and regrowth. Mean values reported above represent the average value for each graph.

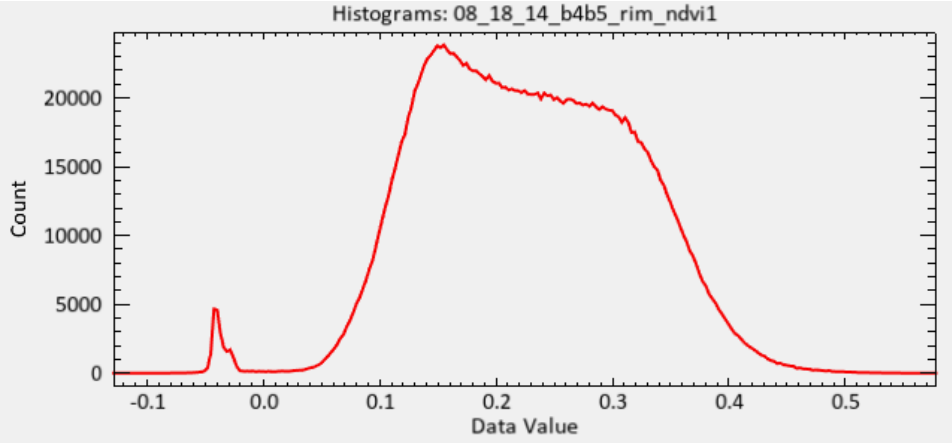
Before Fire:



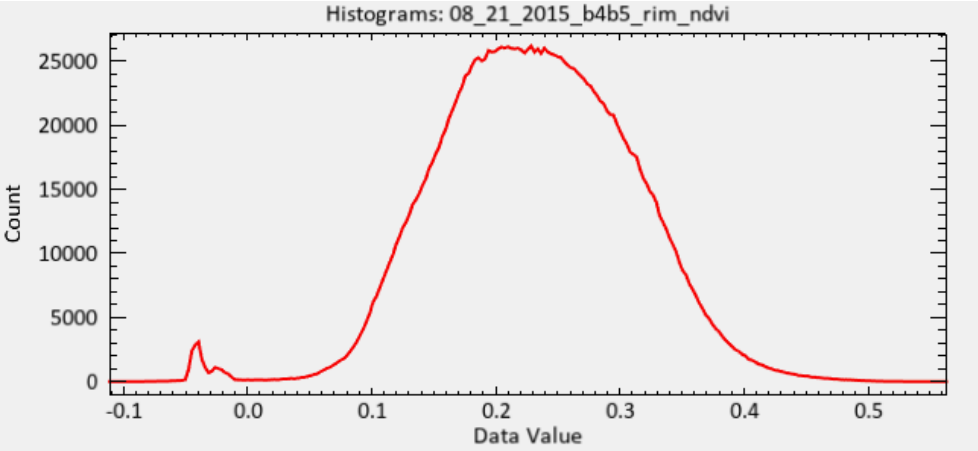
After Fire:



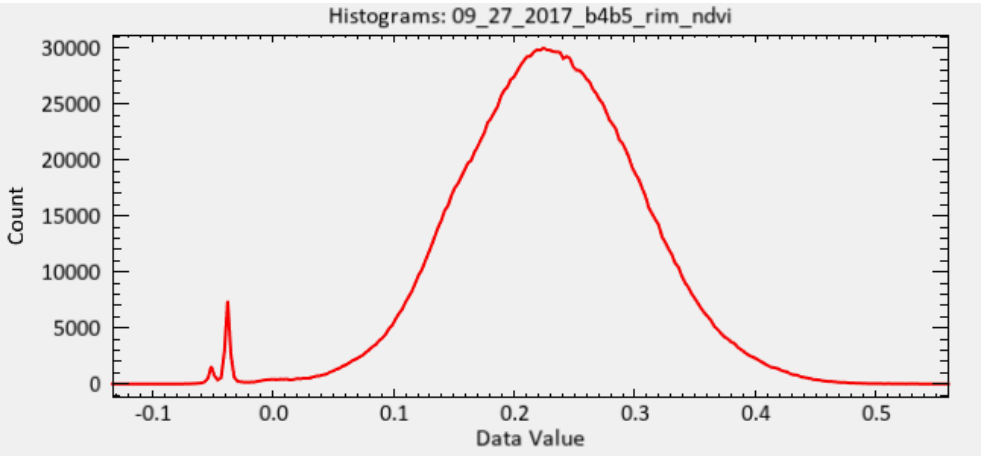
1 Yr Later:



2 Yrs Later:



4 Yrs Later:



The distribution of NDVI values was quite high originally, and after the fire it shifted to be much lower. As regrowth occurs, we can view the bell curve creeping to the right along the plots to increase the mean. This is indicative of the area growing more vegetation. In the final 2017 plot, the bell curve seems to have a relatively normal distribution, which could be an indicator that further growth is unlikely.

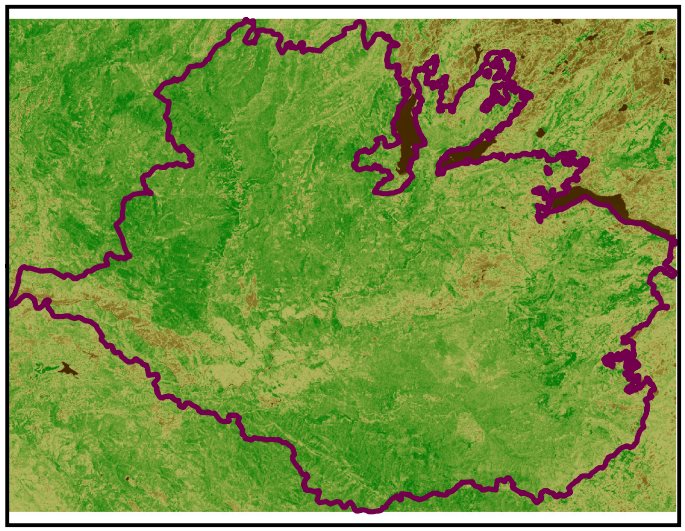
4. Using ArcMap (or QGIS if you are more familiar with this software), create a map displaying each of your NDVI images. It is recommended that you create a single map (i.e. one page) with five data frames (i.e. one per image). Your map document should contain:

    - NDVI images displayed using a divergent color ramp (dark green for high NDVI values, brown for lower NDVI values)
    - The perimeter of the Rim Fire (with NO fill)
    - The date of each image
    - A title, north arrow, and legend (you should be able to use a single legend for all 5 images)
    - Your name

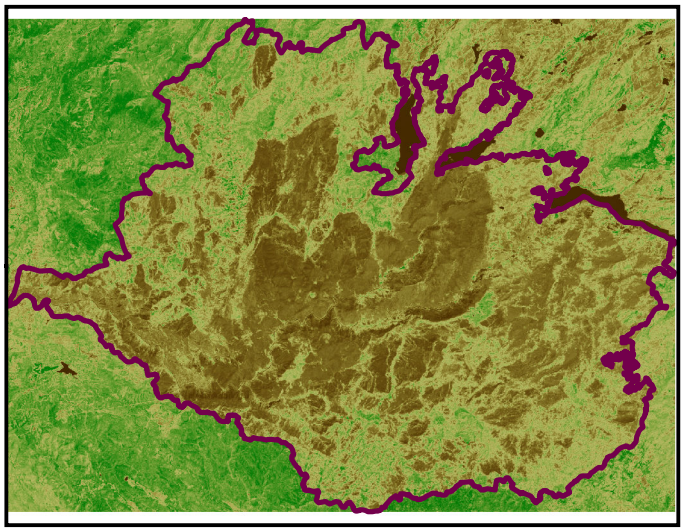
    Export your map **as a PDF** and attach it to your answer sheet.

Visualizing the CA Rim Fire and Vegetation Regrowth through NDVI Images

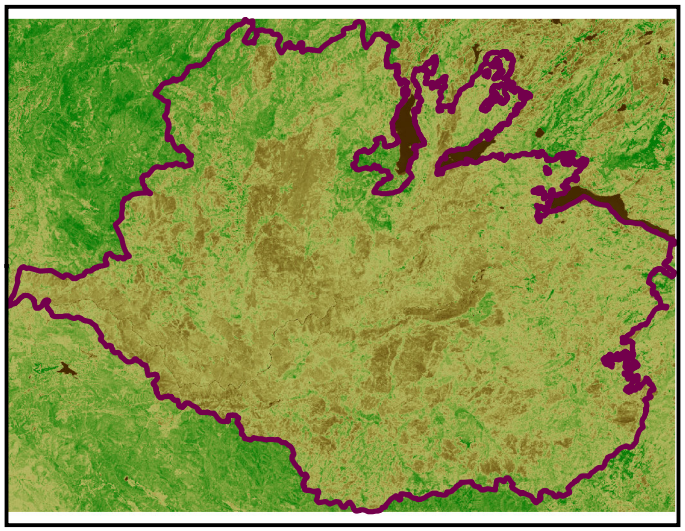
August 15th, 2013



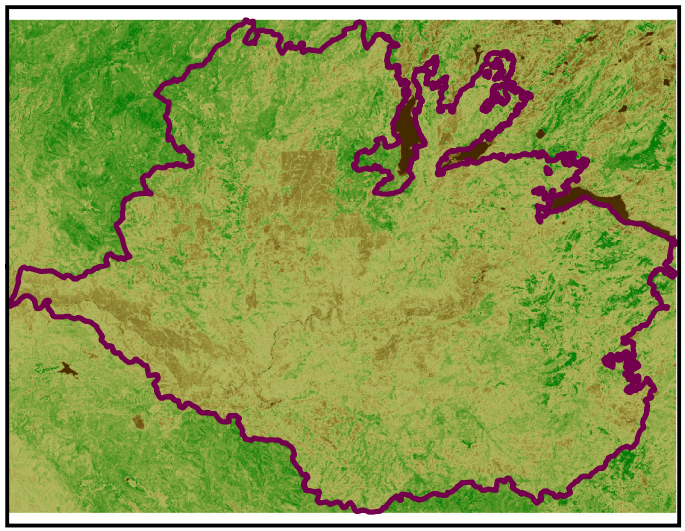
September 16th, 2013



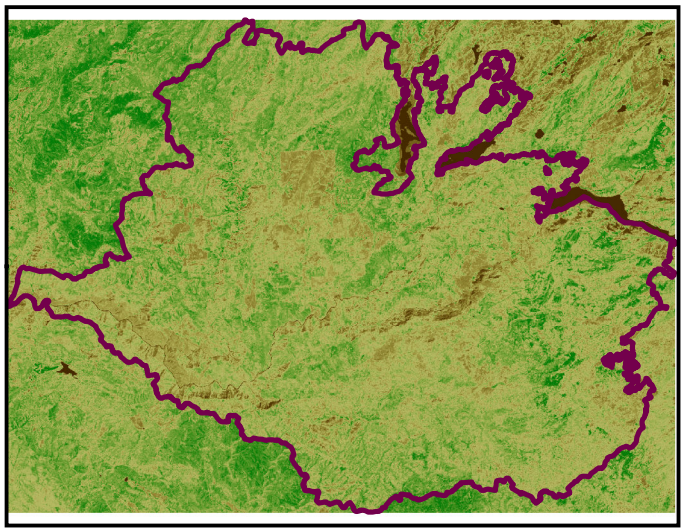
August 18th, 2014



August 21st, 2015



September 27th, 2017



Legend

Rim Fire Extent

NDVI Values

Value

High : 0.59

Low : -0.13

0 2.5 5 10 15 20 Miles

Map Scale 1:558,830

Map by Gwen. https://github.com/gowin20

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