Nicole Bretting
December 7th, 2017

Vegetation Growth Before and After Mt. Saint Helen's Eruption of 1980

Vegetation Change from 1983 to 2014

N

Vegetation Change from 1973 to 1983

N

Kilometers

0   5   10

1:348,594

Kilometers

0   5   10

1:348,594

Coordinate System: WGS 1984 UTM Zone 10N
Projection: Transverse Mercator
Datum: WGS 1984

Explanation

Blown down Trees during Eruption

Water Bodies

Standing Trees

Loss of vegetation

No change in vegetation

Regrowth of vegetation
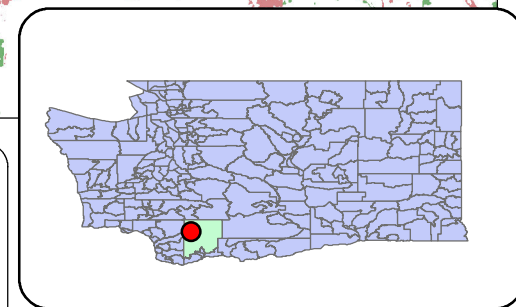
Nicole Bretting

Nmb2278

December 7, 2017

Problem Formulation and Introduction:

   Hypothesis: How has the vegetation been affected from before the eruption of Mount Saint Helens, after the eruption, and to current time? In what way was the vegetation damaged and how has it grown back since the eruption.

   Mount Saint Helens' eruption in 1980 was a devastating blow to the population and agriculture of the area. Not only were many injured, but the livelihood of the land around the volcano was also destroyed in the eruption. My project is over how the vegetation around the volcano grew back and how quickly it recovered. I have taken three Landsat data files from USGS to measure how the vegetation changed from different years before and after explosion. The years I am using for this project are 1973, 1983, and 2014. This will allow for data right before the eruption, right after the eruption, and modern day. I am interested to see and calculate the area for the loss and regrowth of vegetation. This will show how quickly it had grown back as well has how it correlated to the elevation and where the trees had been blown down.

Data Collection:

I found half of my data online through UGSG that were in the form of TIFF files and as shapefiles. I was able to extract needed files through the folders provided online. Through resources Jackson offers, I found DEM files needed to make a hillshade. Also, at the generosity of my professor and classmates, I was able to obtain additional information to complete my project.

1. I found the TIFF files from the website https://remotesensing.usgs.gov/gallery//gallery-nojs.php?id=413&cat=3

2. Obtained the Washington state shapefile from https://catalog.data.gov/dataset/tiger-line-shapefile-2013-state-washington-current-county-subdivision-state-based to add to my layout.

3. Used the R drive to navigate to the Washington database to obtain DEMs to later try to make into a mosaic for a hillshade from this website

   http://gis.ess.washington.edu/data/raster/doqs/index.html

4. I was able to then obtain a hillshade from Dr. Helper and Sean O'Donnell to use on my project as the DEMs I had did not work as they were not the right format.

5. Dr. Helper also provided me with shapefiles and other useful information to use on my project that will allow for a better understanding of how the vegetation was affected.
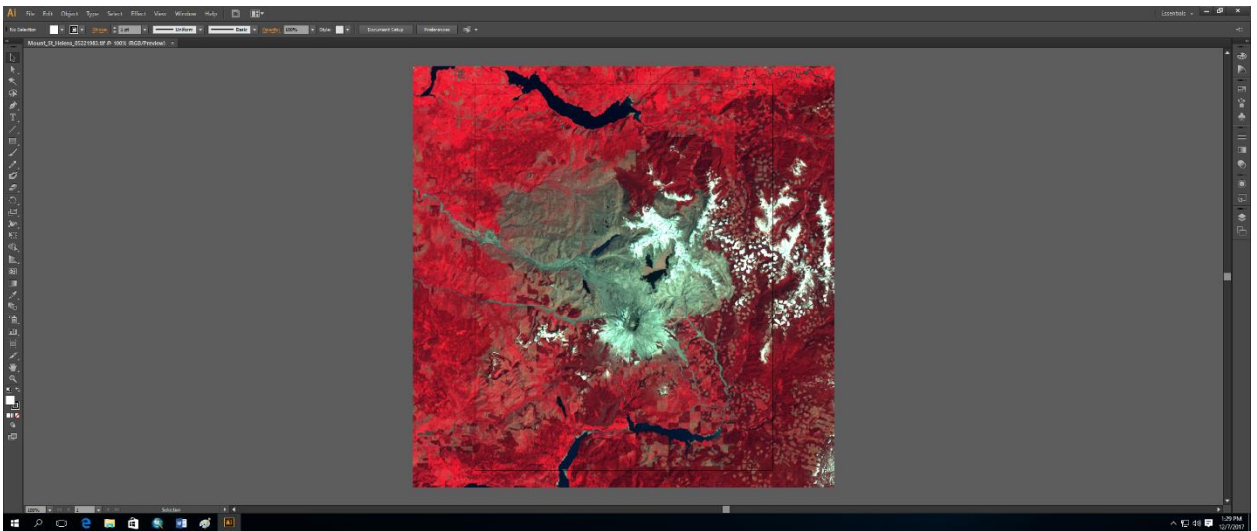
Data Preprocessing:

Downloading the files

1. T files were taken from downloaded site (https://remotesensing.usgs.gov/gallery//gallery-nojs.php?id=413&cat=3) and put into Photoshop to change the image mode from RGB color to Indexed color.

2. This image is then altered with a local (selective) palette. This allows for the panel to be applied to the individual pixels in the image. It favors the broad areas of color to allow the image to be distinguished by color more easily.

3. The number of colors was lowered from 256 to 9 to narrow down the color range. This would show the different areas of vegetation with different types and conditions.

4. The forced is then changed to none to allow for no specific color panels. No matte or dither is applied to have a clear boundary between each pixel easier for raster calculations.

5. The image compression when saving the addition tiff file needs to be none so that the file is not altered to a different size.

6. The byte order is also IBM PC.
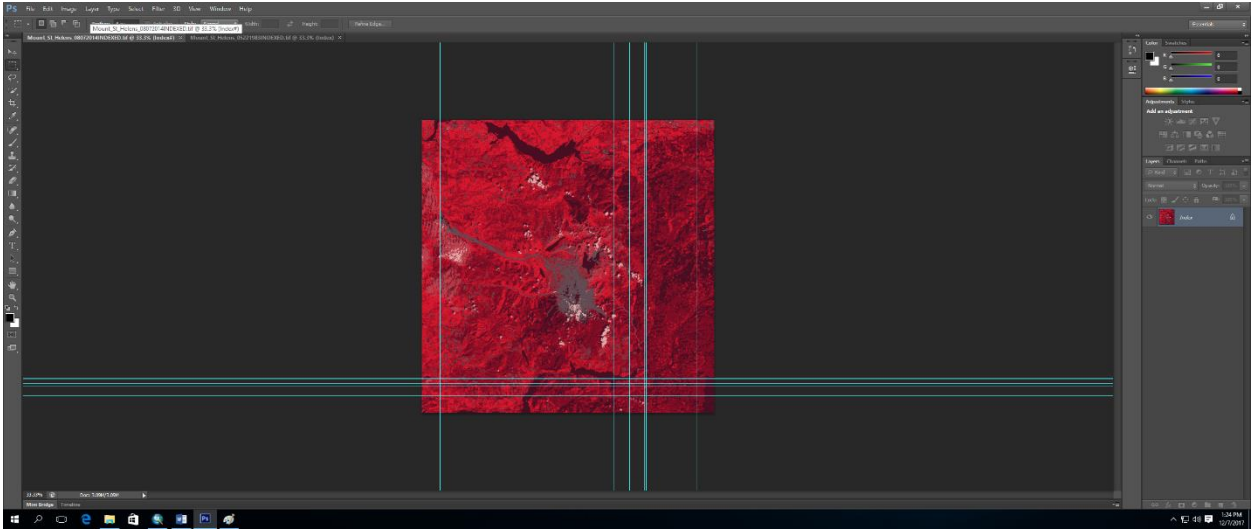
7. I had troubles with the 1983 tiff file because it became corrupted. This led to having to

   put it through adobe illustration and making it into an AI file. This allowed for it to be

   uploaded into Photoshop to be modified like the other 2014 and 1973 file.
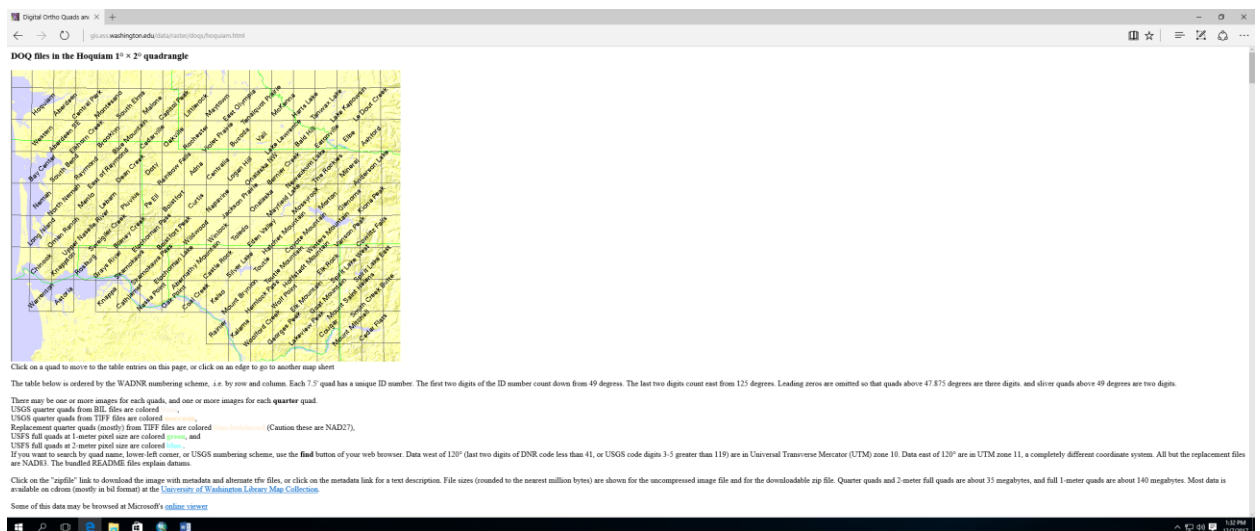

8.

ArcGIS processing:

Georeferencing

1. I then uploaded all three files into ArcMap to compare and georeferenced to the original tiff files from download. However, the cell size was then uploaded to have a size of 0.007. This make the tiff file significantly smaller than the originals.

2. To georeference, I took the original files and zoomed to the layers.

3. Then, I fit these images to display and then selected the indexed tiff files in the **georeferencing** tool. This allowed for them to have an updated Georeference to the fitted display of cell size 32.4. This deems the original tiff files unnecessary now as they still have the 256 rgb bands.

4. To make sure that all the images were the same cell size, I had to go through and manually georeferenced each image. This caused some of the DEM files I was going to use to not match up with the underlying files anymore.

5. To fix this, I used the **Georeference tool bar to link the images together.**

DEM files

1. Using the R drive, I went to the Washington GIS website to download the DEM files for the area around Mt. Saint Helens.

2. Using the website http://gis.ess.washington.edu/data/raster/doqs/index.html, I use ortho quad and selected area Ho quiam which then lead to the DOQ files in that region.

3. After finding the mount saint Helens file, I then took the files around this area which were: Coyote mountain, Hoffstadt mountain, Elk mountain, Lakeview peak, Winters mountain, Elk rock, Goat mountain, Couger, Vanson peak, Spirit lake west, Mount saint helens, Mount Mitchell, Cowlitz falls, Spirit lake east, Smith creek butte, Cedar flats, Greenhorn buttes, French butte, Spencer butte, and Burnt peak.

4. This allowed for most of the tiff file containing the index color band to be covered by DEM. However, the problem I am facing now is that the DEMs are from a specific time period. I am unable to find DEMs for the years 1973, 1983, and 2014.

5. After collecting the data into a file, I then uploaded them all at once through the add data on ArcMap. This allowed for me to have 20 different TIFF DEM files.
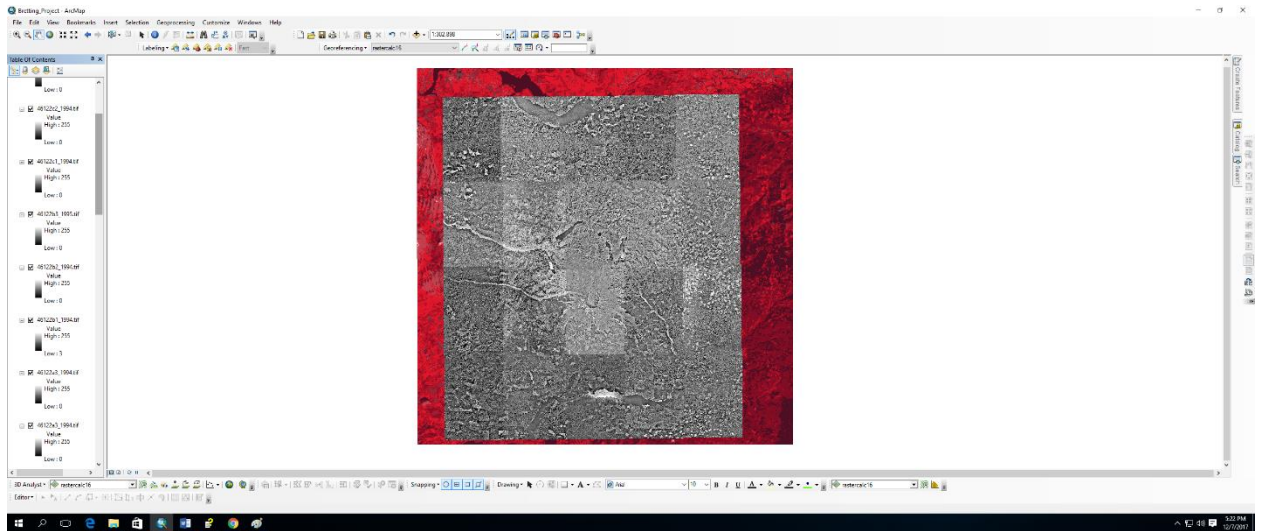
6. However, I was not be able to make this into a mosaic with the **DEM to Mosaic Tool** as the TIF files do not work for this process.

7. To have an accurate hillshade, I had asked my classmate, Sean O'Donnell, for his hillshade he made in the past. This allowed for me to add a 3D effect to represent elevation of the vegetation.
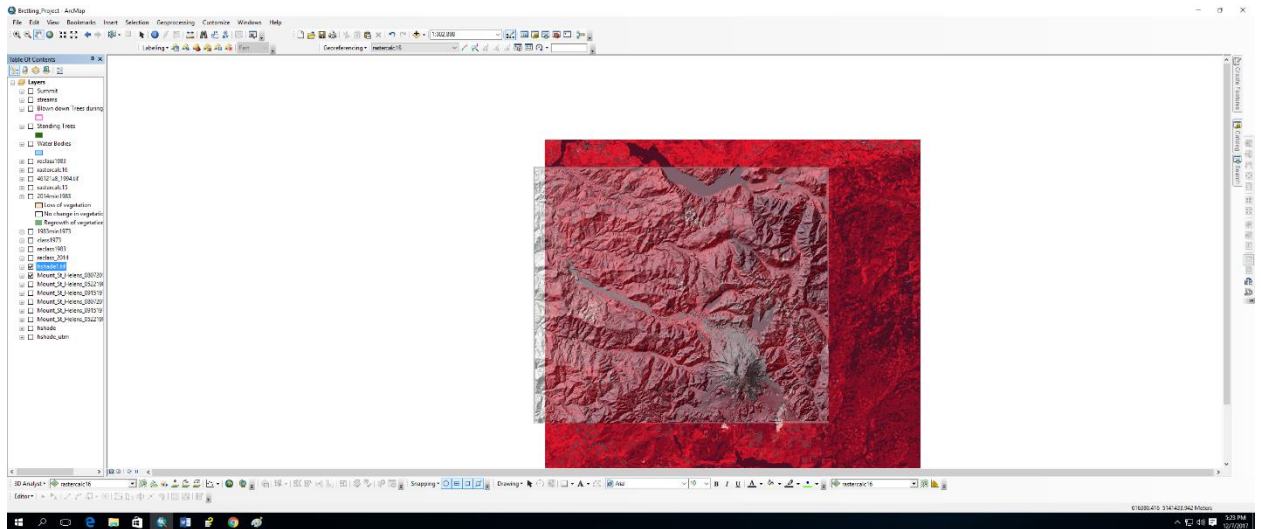
8.

False color composite

1. The tiff files used are in the form of false color composite which means that the display color is for any band of a multispectral image. The colors do not actually resemble the color of the area. The RGB bands are broken up into 3 bands that are NIR bands, Red bands, and Green bands. This allows for the vegetation of the area to be detected in the image. The vegetation appears in different shades of red depending on the types and conditions of the vegetation. The high reflectance appears through the NIR band for this composite. In these images, the forest is portrayed as bright red with patches of logging. The snow of the area appears in white and the ash from the blast is appearing in gray. The tiff files also show the vegetation regrowth in the light red or pink colors. This is shown in the devastated areas of the image near the caldera.

2. To fix this issue of having many different colors that do not correctly represent vegetation, I have broken down the files into two different colors to symbolize no vegetation and vegetation of the area.

3. To do this, I used the **Reclassification tool** to classify the 9 specific values into two values. I then went to the attributes table to then sort through the values and see what color corresponded to either no vegetation or vegetation. I used the **Identification tool** to analyze the data and to know which numbers to use when selecting the range for reclassification.
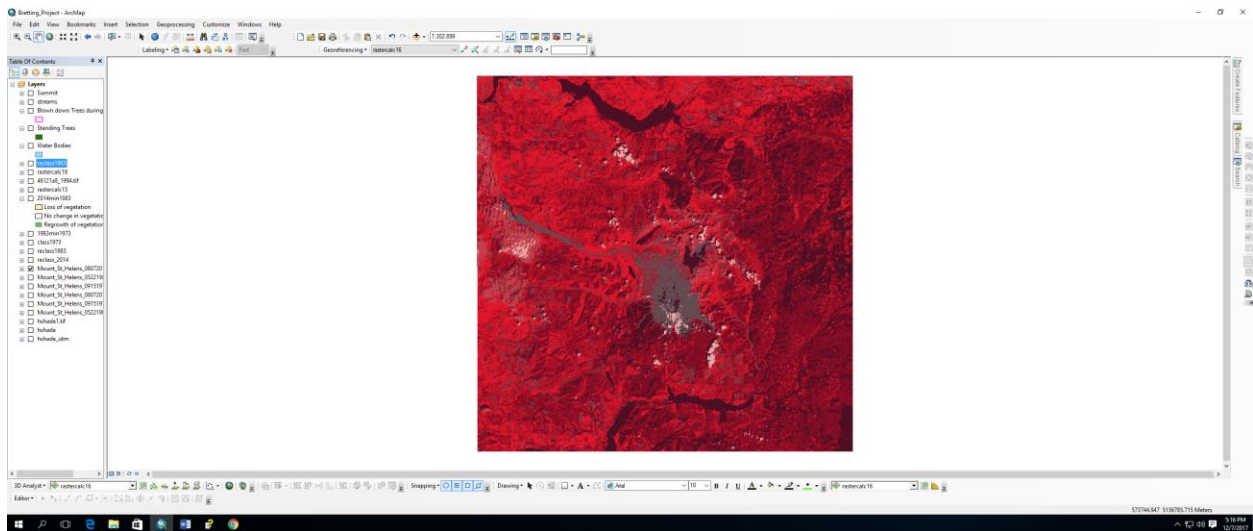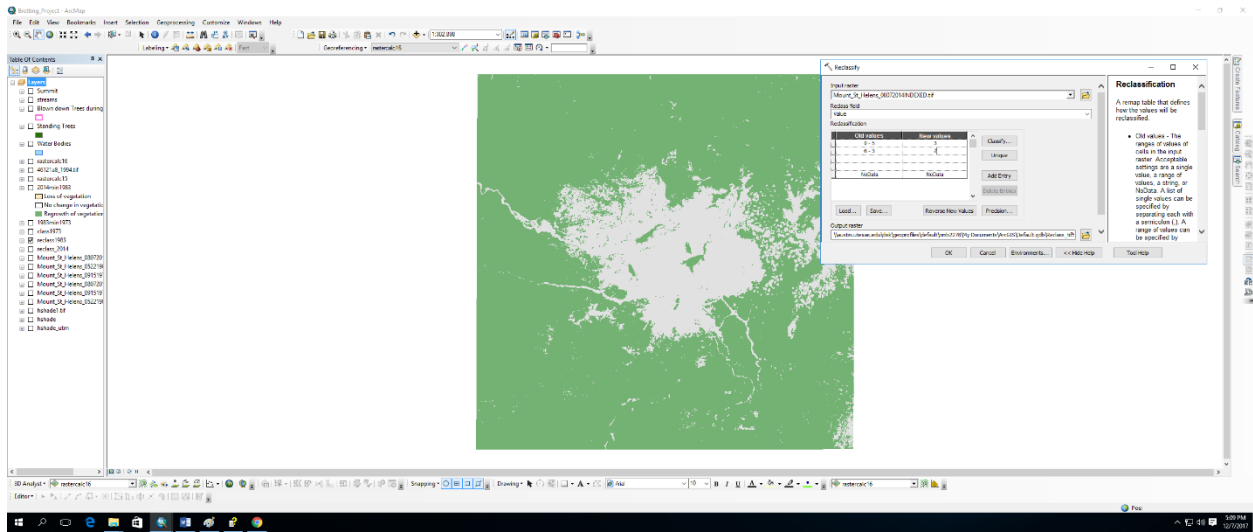
Raster Calculation

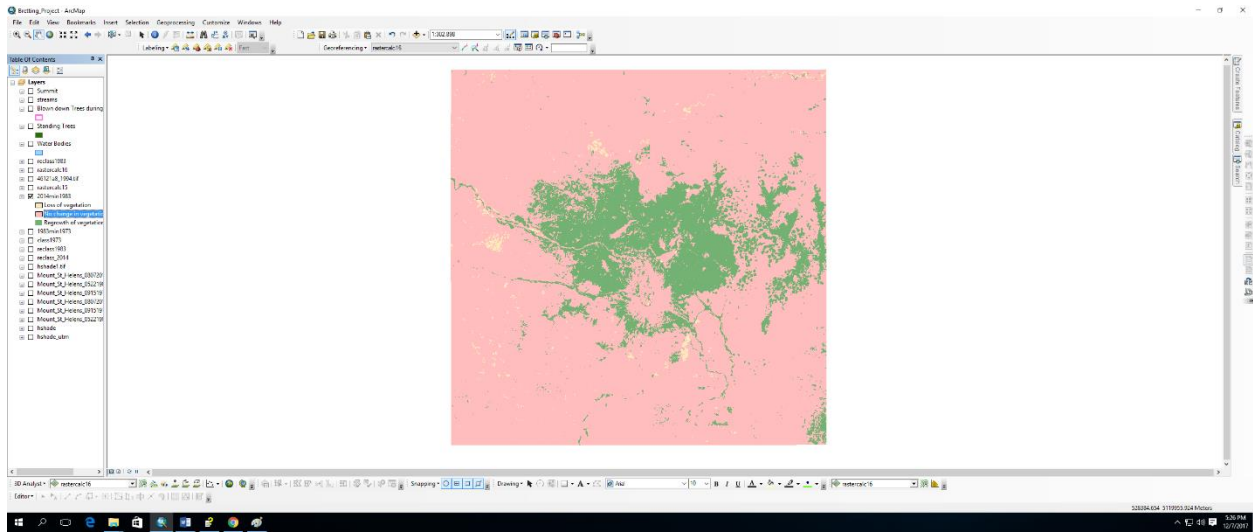1. For this process, I will calculate the change in color areas from all three photos by taking the change from 1973 to 1983 showing how the blast had affected the vegetation of the area pre eruption.

2. Then I will take the calculation from 1983 to 2014 to show the regrowth of the area around the eruption.

3. I have taken raster calculations of 1973 to 1983, 1983 to 2014, and then 1973 to 2014. However, instead of 9 different colors that photoshop allowed for the raster to be summed down to, it has 14 colors.

4. I have made the calculation colors of the raster all the same for each 3 new rasters. It seems although that they do not correspond the correct areas. To fix this problem, I had to go into the reclassification tool to summarize the 9 colors into 2 to show lack of vegetation and places where vegetation were present

5. I then took both raster calculations with the files I had that were two colors. To have the same results for all three files, I did this to the other years as well. The results I then received looked like this for what the change in vegetation looked like from years 1973 to 1983 and 1983 to 2014.

6. Taking these files, I then hollowed out the area that the vegetation did not change and focused primarily on the change of the region. This was represented in coral to show the loss of vegetation and green to show the regrowth of vegetation.

7. I then compared the two raster calculations from 1973 to 1983 and 1983 to 2014 to see the loss and the regrowth of vegetation.

Adding files and editing data

1. I added the files that were given to me by Dr. Helper and Sean O'Donnell to the data I created to add additional information. This allowed for the comparison of the blown down tree line, elevation, and standing trees to the loss of vegetation to be observed.
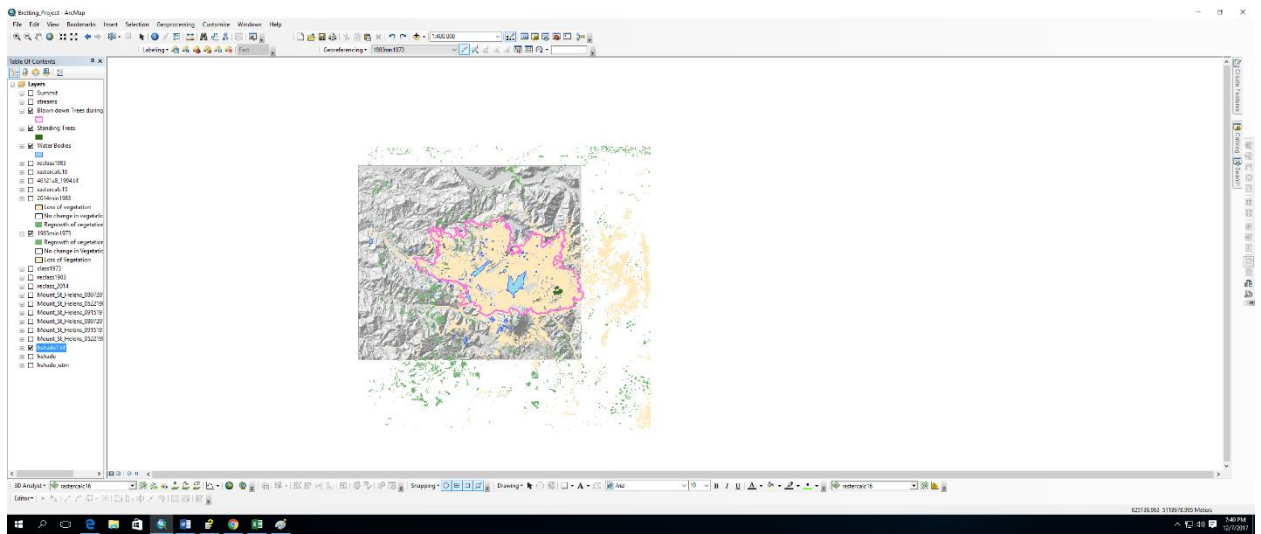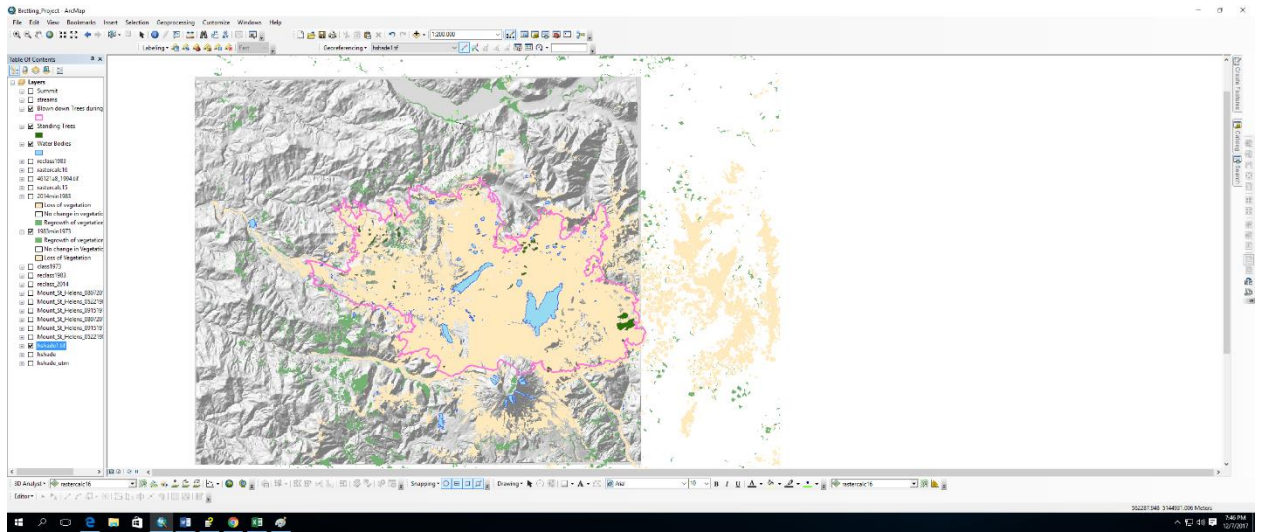
2.

3. The raster did not align to the features correctly, so I edited the features by selecting the

   water bodies for example and matching it to the unchanged areas on the map.
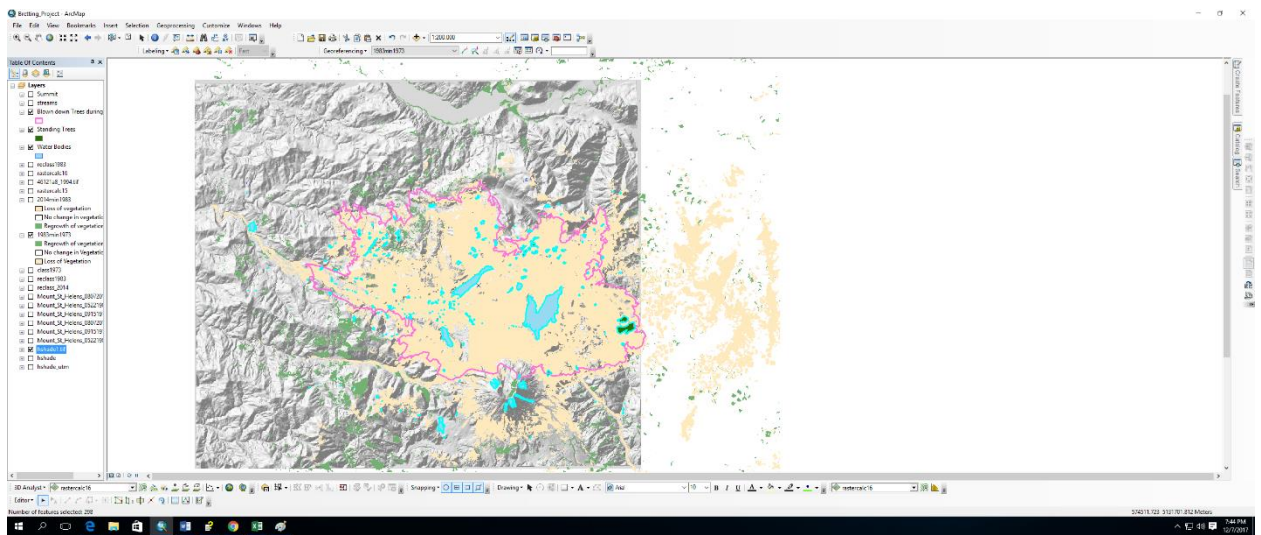
4.

5. The hillshade did not align to the file either, so I had to georeference this to match the

   lakes shown on the hillshade.

6.

7. This allowed for all of my data to be properly measured and shows how the landscape
   affected grow back of vegetation.

8. To make sure that all of the coordinate systems were the same, I went into ArcCatalog
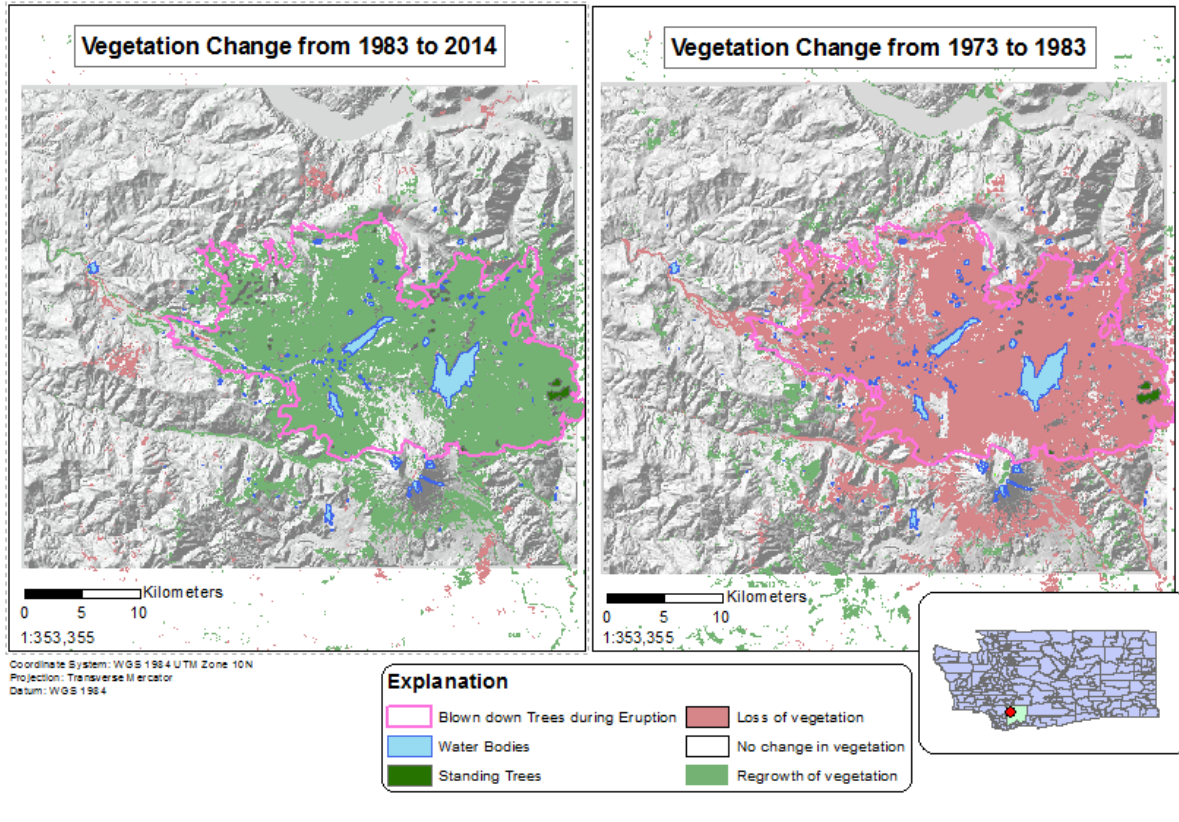   and changed the spatial references.
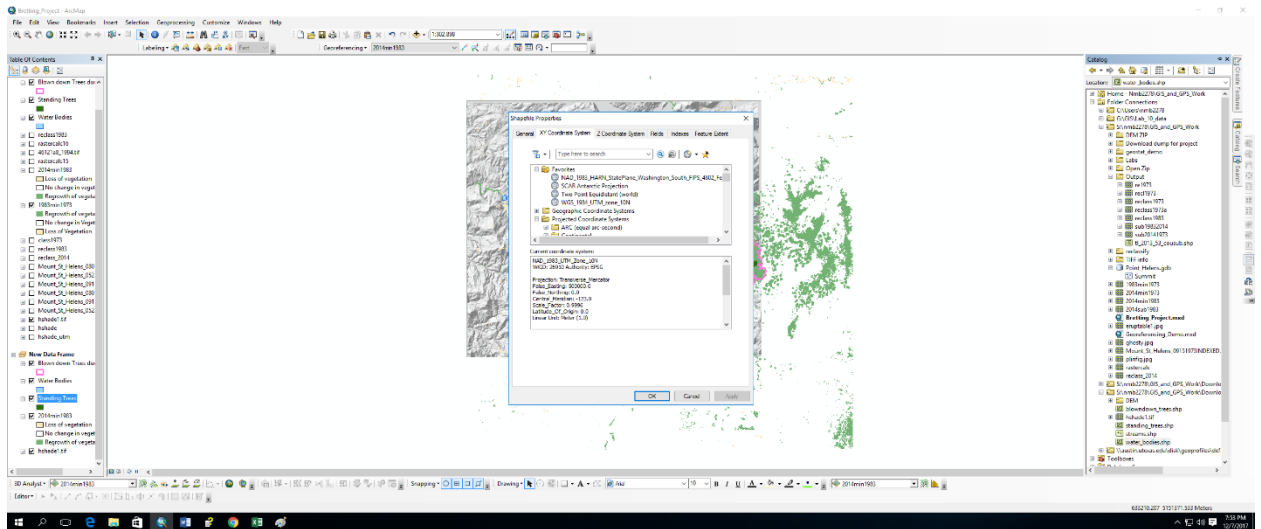
9.

10. This was the last of the data I needed to edit to have my final product and make the map.
    This allowed for me to calculate the change in vegetation and to visually observe the
    affect from the eruption.

Data Presentation:

Vegetation Growth Before and After Mt. Saint Helen's Eruption of 1980

Vegetation area change in kilometers		
1983 to 2014		kilometer
	Loss	27.901
	No Change	2614.818
	Regrowth	538.056
1973 to 1983		
	Loss	113.905
	No change	2531.381
	Regrowth	538.47

Conclusion:

In conclusion, I had completed my task of observing the vegetation change from before and after the eruption in 1980 of Mount Saint Helens. I created this project to observe how the eruption had affected the surrounding area as well as how the vegetation had grown back after. I had learned that volcanic deposits are rich in nutrients and allow for farmlands to thrive. This is very much observed seeing the vegetation regrowth primarily where the trees were blown down from deposits. I calculated the overall area of vegetation regrowth to be approximately 538.47 square kilometers from after the eruption. I believe that the vegetation will continue to thrive in the surrounding area.

Sources:

"Land Remote Sensing Image Collections." *Land Remote Sensing Image Collections*, USGS, 2

      Dec. 2016, remotesensing.usgs.gov/gallery//gallery-nojs.php?id=413&cat=3.

Allen, Jesse. "Https://Svs.gsfc.nasa.gov/959." *NASA*, NASA, 9 Apr. 1999, svs.gsfc.nasa.gov/959.

Liew, S. "Interpreting Optical Remote Sensing Images." *Principles of Remote Sensing - Centre*

      for Remote Imaging, Sensing and Processing, CRISP, 2001,

      crisp.nus.edu.sg/~research/tutorial/opt_int.htm.

"TIGER/Line Shapefile, 2013, State, Washington, Current County Subdivision State-

      Based."*TIGER/Line Shapefile, 2013, State, Washington, Current County Subdivision*

      State-Based - Data.gov, Responsible Party Unknown, 14 Nov. 2013,

      catalog.data.gov/dataset/tiger-line-shapefile-2013-state-washington-current-county-

      subdivision-state-based.

Green, H. "Digital Ortho Quads and Quarter-Quads for Washington State." *Digital Ortho Quads*

      and Quarter-Quads for Washington State, 19 Feb. 2016,

      gis.ess.washington.edu/data/raster/doqs/index.html.