CREATION OF ANIMATIONS WITH RASTER TEMPORAL DATA OF PARAMO FIRES IN BOYACA COLOMBIA

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CONTENT

PROBLEM - GOAL

CHANGE ANALYSIS

VISUALIZE ARCGIS

VISUALIZE ARCPRO

3D MODEL ARCPRO

CONCLUSIONS

Source: https://www.facetasdeboyaca.com/quema-de-frailejones-en-paramo-de-siscunsi-oceta-genera-rechazo-en-el-departamento/

PROBLEM
Siscunsí–Ocetá Natural Regional Park

- Colombia reports to have approximately 50% of the world's paramos
- Boyacá 1 out of the 32 departments in Colombia has the largest extension of paramos in the country: aprox. 18,3% - 531.822,88 Ha (Peñuela Narváez, 2018).
- Paramos are high mountain ecosystems (3000-4000 mamsl), responsible the main river networks (fresh water) (Prensa, 2021).
- These are fragile ecosystems since their growth of fauna is extremely slow.
- 2020 the year of many fires on the paramos – example of Parque Natural Regional de Siscunsí–Ocetá.

Goal:

- Visualize the temporal changes of the NDVI from the Natural Regional Park through an animation or GIF with ArcGIS and ArcPro.
- Model the difference of the NDVI from March 2020 and January 2021 with ArcPro

CHANGE ANALYSIS

- In order to observe the vegetation changes on the ground due to the fires, a Normalized Difference Vegetation Index was calculated. Since healthier vegetation absorbs most the visible wavelength and reflects mostly NIR light. (Carlson & Ripley, 1997)
  - Sentinel 2 L2A images: Bands 4 (RED) and 8 (NIR); 10 meter resolution
  - Months: Jan – May and September, December, January 2021
- Programs used
  - ArcGIS 10.6 (raster data time series)
  - ArcPro 2.7 (vector data time series and 3D modelin)
  - Short animation videos were the results.

$$NDVI = \frac{Band\ 8 - Band\ 4}{Band\ 8 + Band\ 4}$$

(Carlson & Ripley, 1997)

$$NDVI\ values = \{-1 - 1\}$$

(Carlson & Ripley, 1997)

NDVI SPECIFICATIONS

ARCGIS

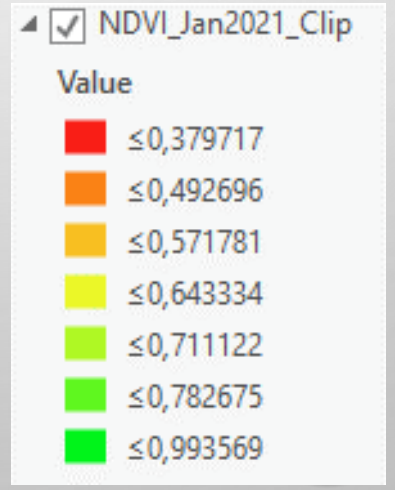
- Manual classification
- 3 classes (Brown, J, n.d.)

Class	Value
Healthy Vegetation	0,55 - 1
Shrubs – dried vegetation	0,2 – 0,55
Bare soil	0-0,2

(Brown, J, n.d.)

ARCPRO

- Jenks natural break
- 7 Classes (For both NDVI and difference calculation)
- Diverging color ramp (diff calc)



VISUALIZING RASTER DATA ON ARCGIS

NDVI rasters completed

Create a mosaic data set

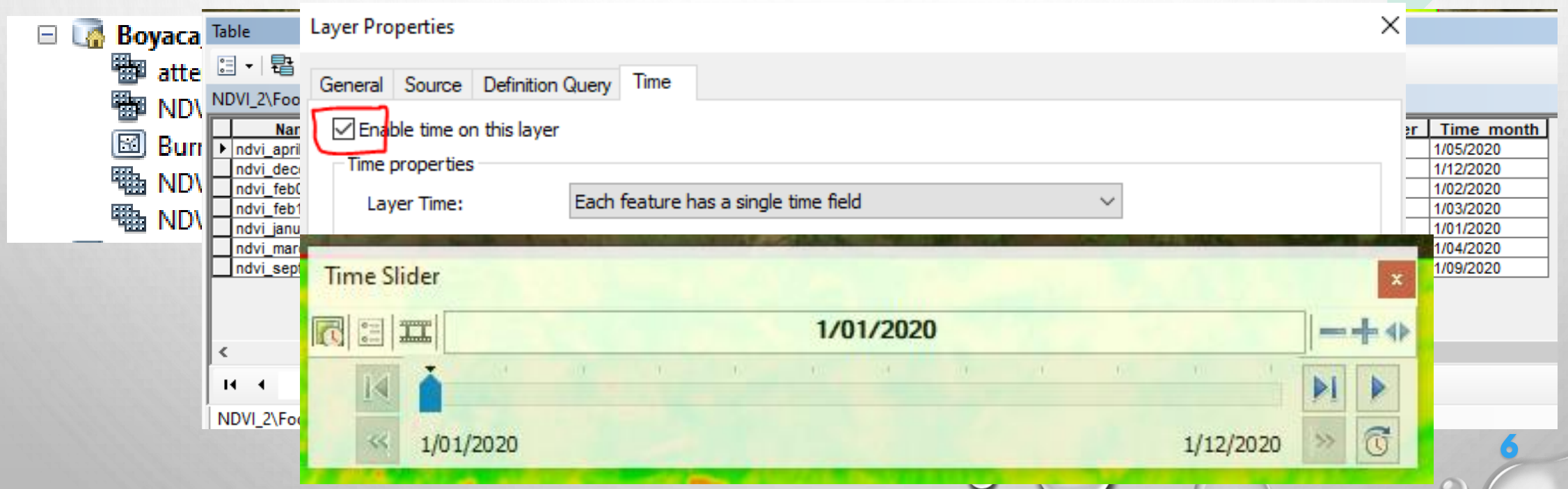
Add all rasters to the Mosaic data set

Add date field to the new attribute table on the mosaic data set

Add the months to the field corresponding to the rasters

Activate the time tab and add the time slider

Save as gif or short video



VISUALIZING RASTER DATA ON ARCPRO

NDVI rasters completed

Classify the NDVI
- 0 – 0,2
- 0,2-0,55
- 0,55 – 1

Reclassify each raster (float – int)
- 3
- 2
- 1

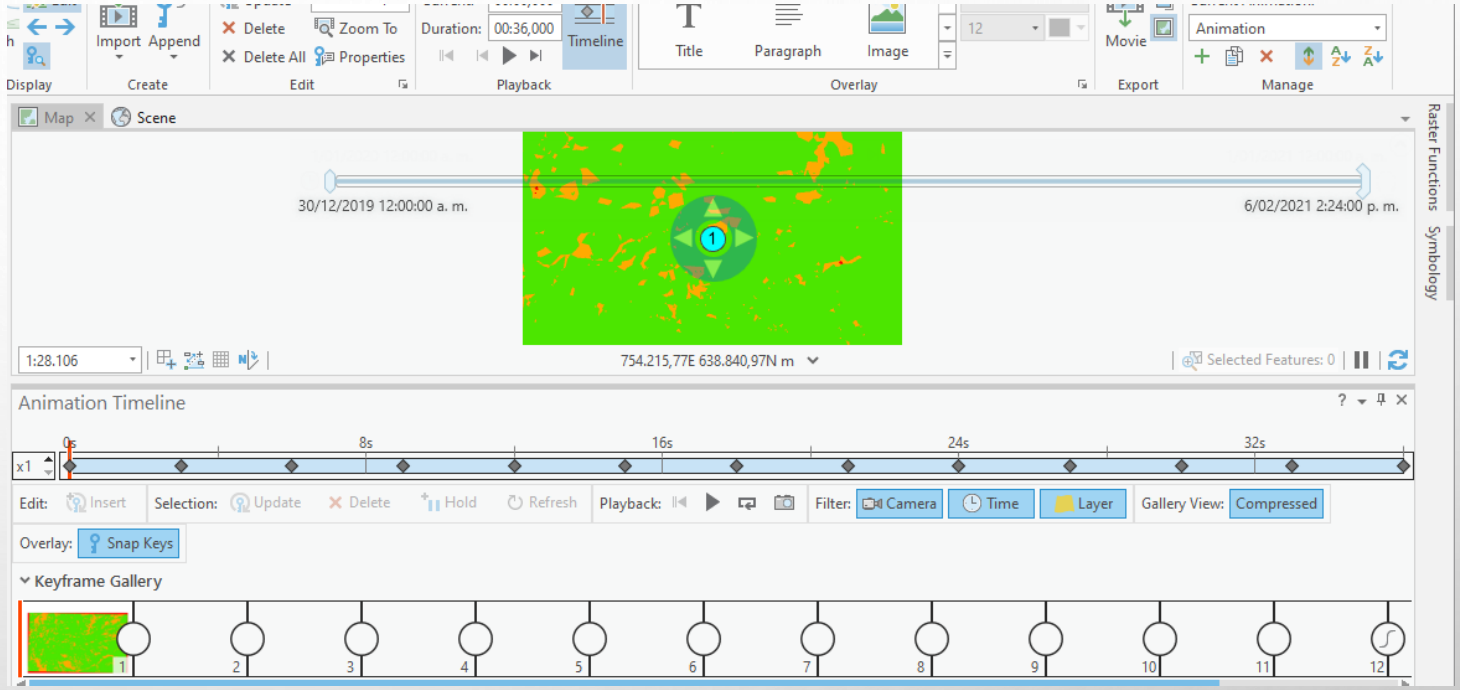
Convert raster to polygon

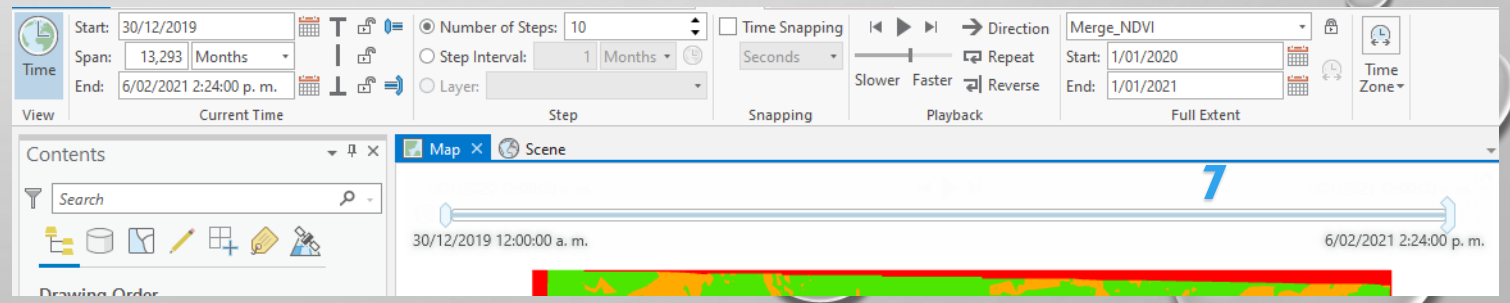
Add date field on each shapefile and merge all

Activate the time tab and add the time slider

Adjust the time slider to your need and activate the animation tab

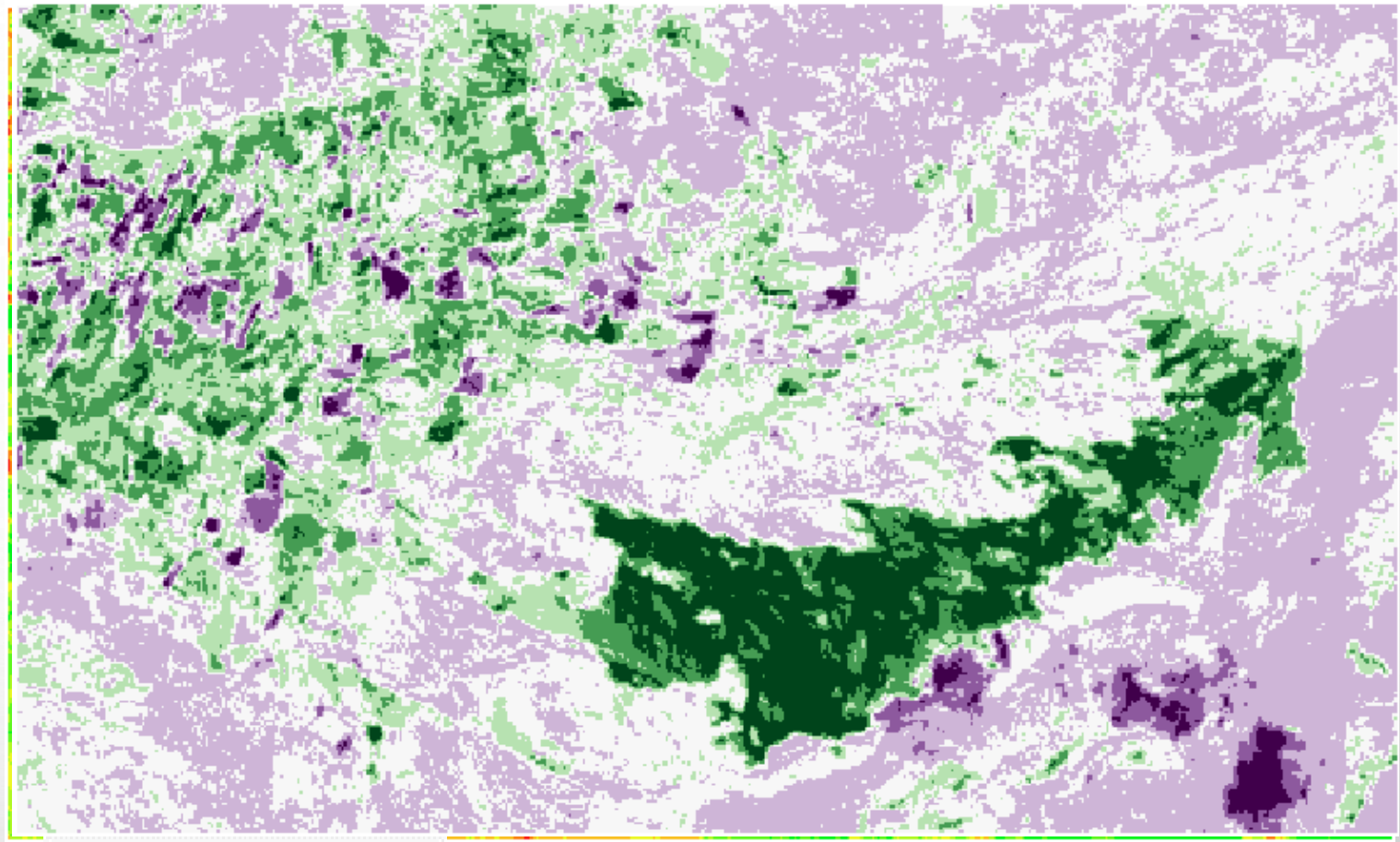
Edit your animation with texts or images, to your desire – SAVE CLIP





3D MODELING ARCPRO

- NDVI was classified in 7 classes
- To calculate the difference between March (most affected) with January 2021.
- To observe if there was a growth of vegetation between these dates.
- The result of this difference; dark green shades indicate that there was an increase in vegetation, white or lighter areas indicate not much change, darker purple areas show that there was a loss in vegetation.



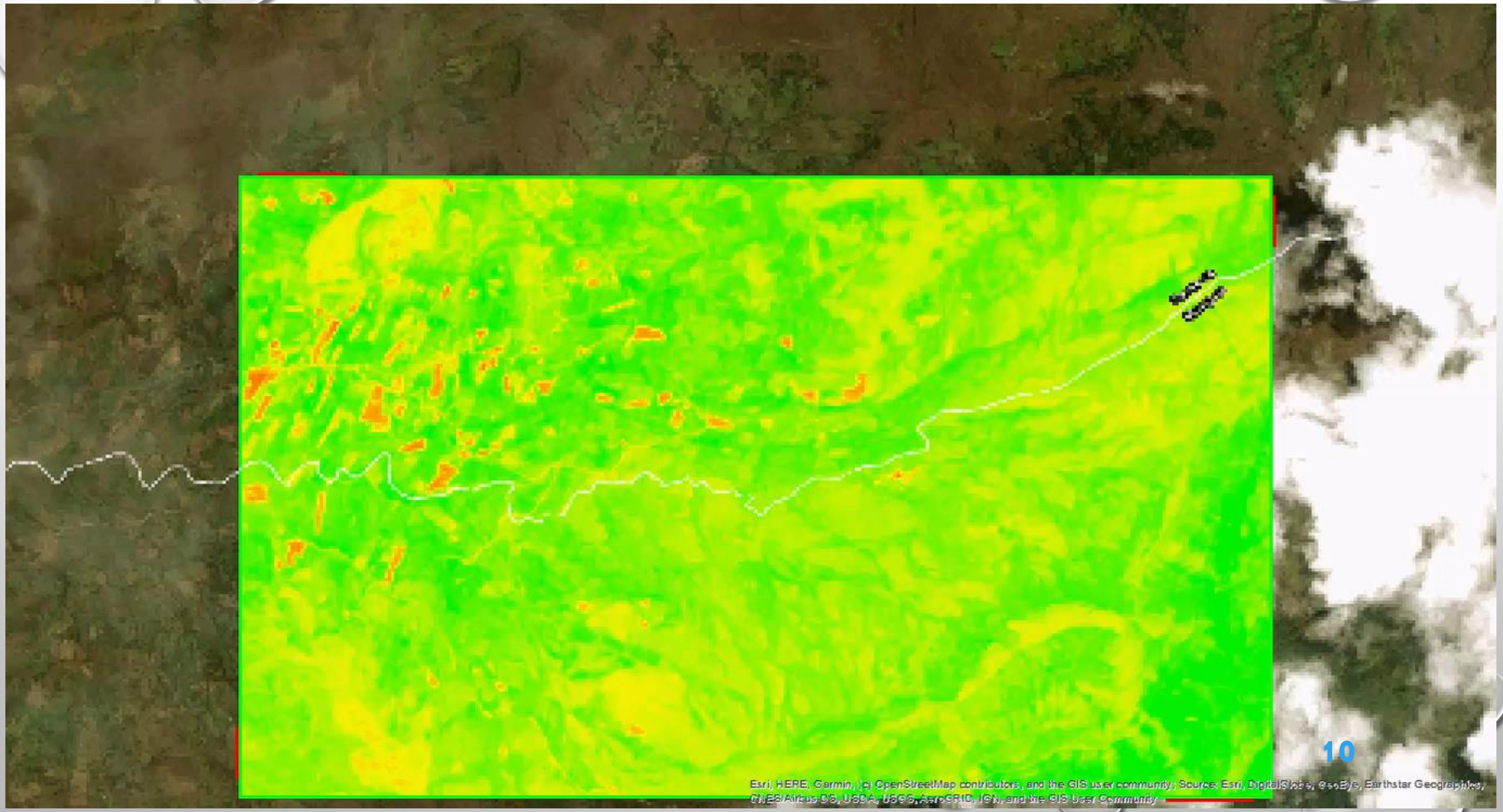
3D MODELING

Classified the values in 7 classes

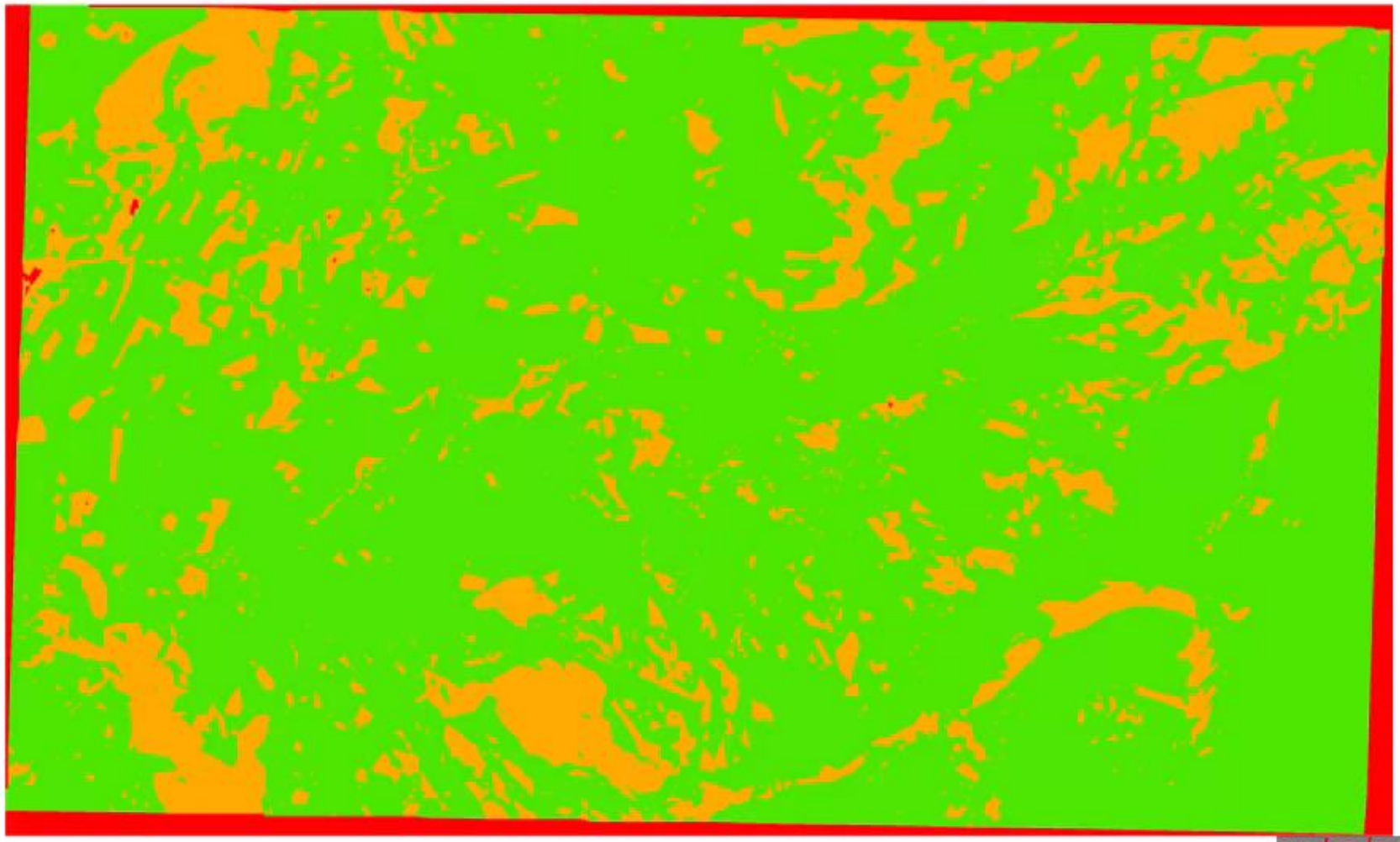
Reclassified the values

Raster to Polygon (INT)

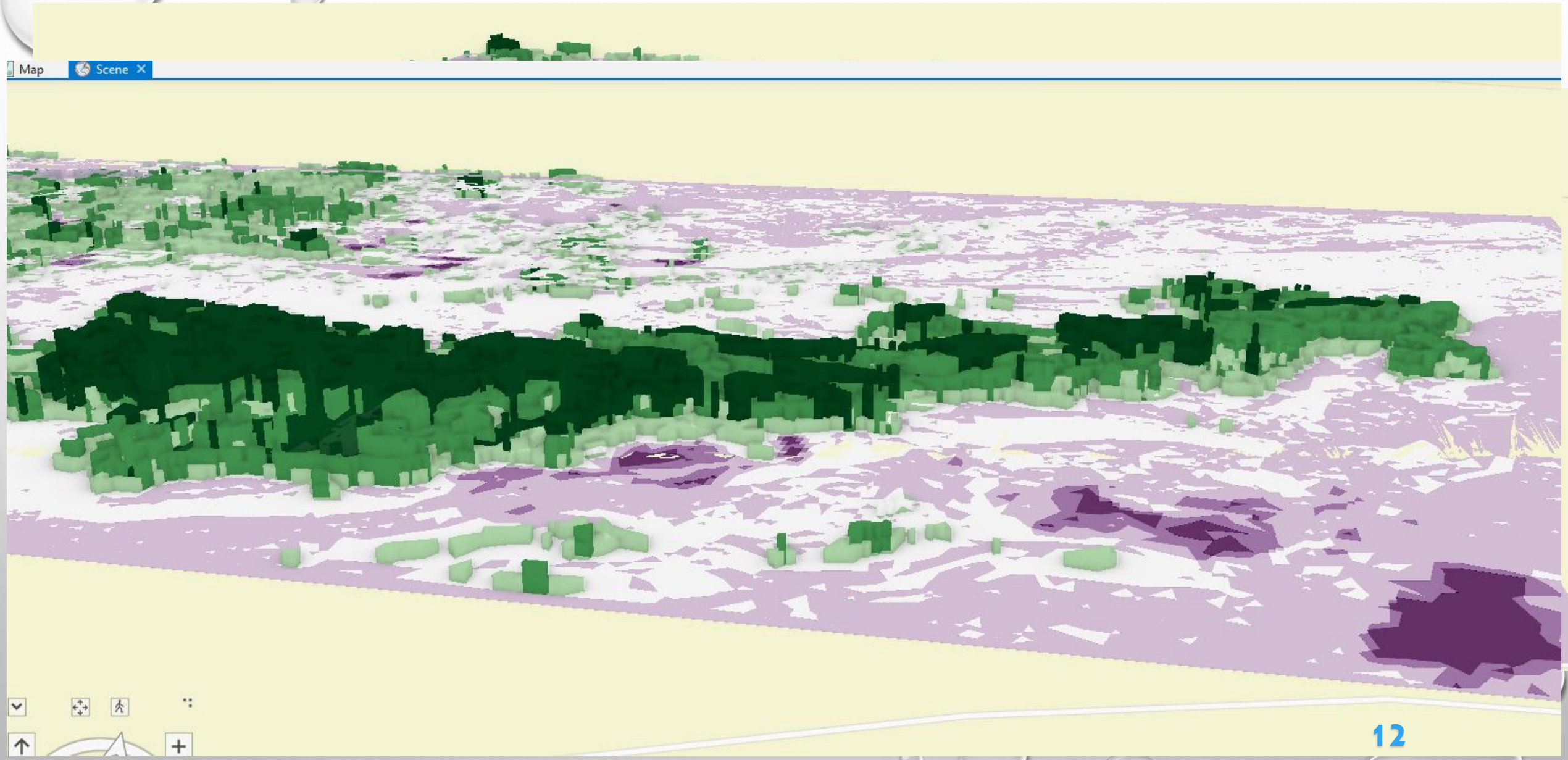
Moved the layer to a 3D scene where the values were extruded


Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community; Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NDVI Time Series in Boyaca - Colombian Paramos



30/12/2019 12:00:00 a. m.
1/01/2020 12:00:00 a. m.


Map
Scene

CONCLUSIONS

- The vegetation recovered quickly, by the second month there was an increase in the vegetation index in the areas the were very affected.
- For better results on the effects of the burn, the Normalized Burn Ratio which identifies burnt areas; where in stead of the RED band like on the NDVI, the SWIR band is used (UN-SPIDER, 2021).
- For a more continuous and smoother video or animation, its best to have all the images of the range that you will analyze; in this case a year. Where several months were not accounted for.

- Due to all the technical problems, recommend pc with better specifications
- ArcPro is missing the option to add timestamp to raster data in order to activate the time slider.
- Arcpro has lots of features, with the final merged data in ArcPro you can overlay it on a DEM and visualize it on a 3D surface.

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