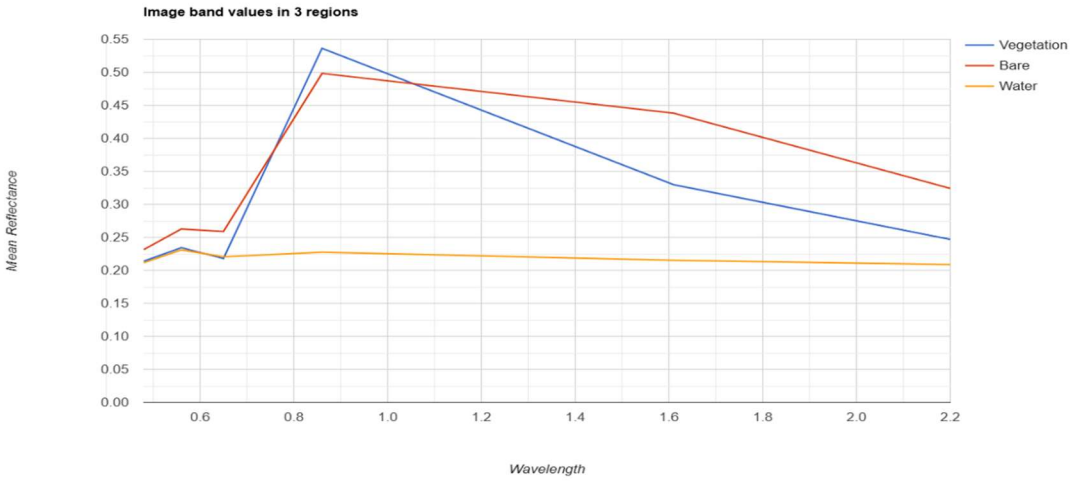
LAB7: SUPERVISED CLASSIFICATION: SPECTRAL UNMIXING

Mst Sanjida Alam

Introduction to Remote Sensing

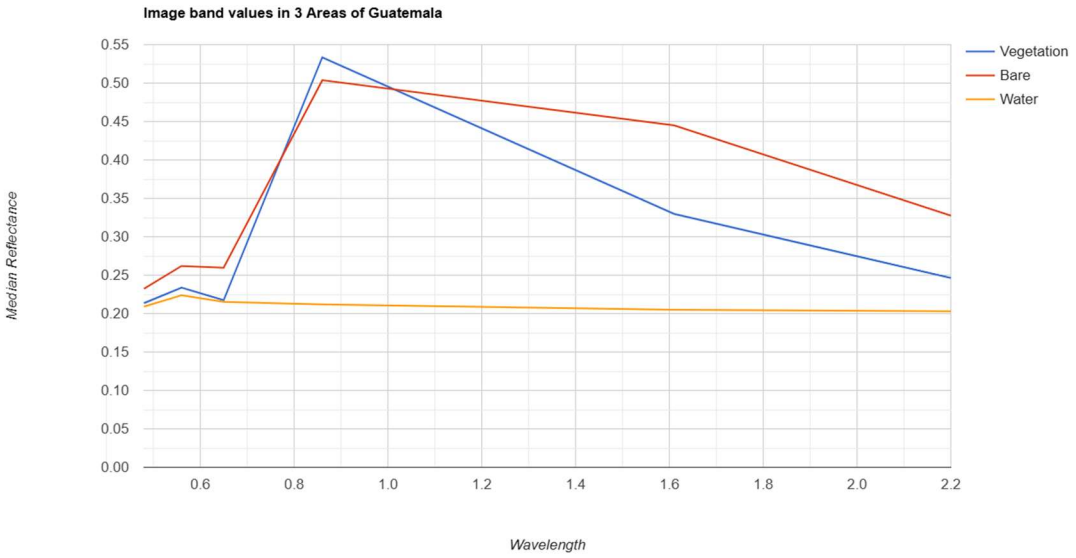
Link: https://code.earthengine.google.com/161c9e736ec49b514a3806239eb6b11c

a) Interpret the separability of each class.

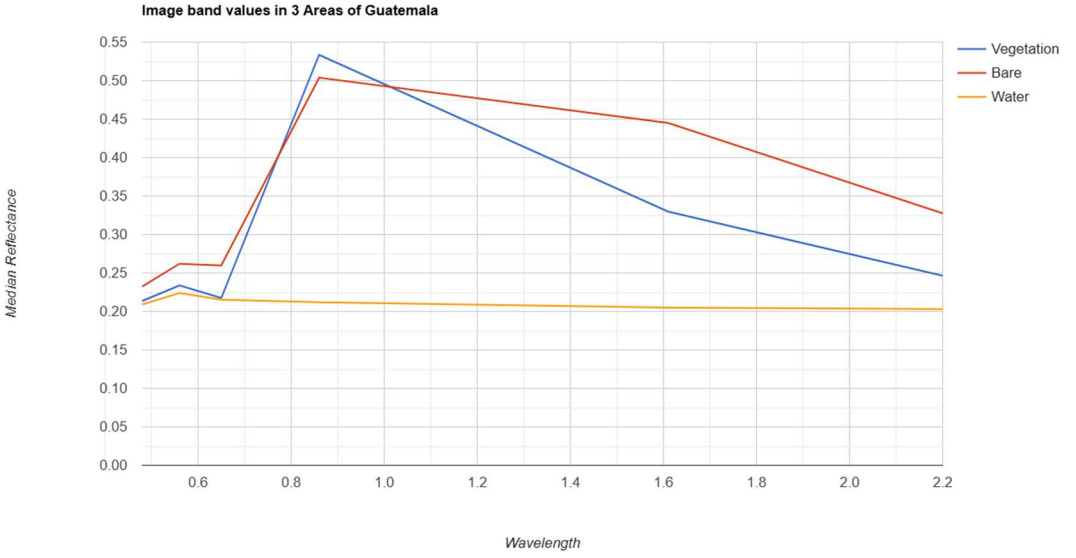


Three classes are showing good separability may be because of their physical distribution and way of reflectance. The Water has consistently low reflectance across all the wavelengths, which is highly separable from both vegetation and bare soil. Vegetation and bare soil are adequately separable. Although they show some overlap in the initial wavelengths, vegetation has a distinct peak at wavelength 0.86 followed by a drop, which makes it relatively easy to distinguish from bare soil. Finally, bare soil has a high reflectance value at wavelength 0.86, just slightly below vegetation. Its reflectance decreases steadily across wavelengths, but it remains above water and vegetation that makes it distinguish from others. In this way, each class are separatable across all the wave length.

b) Change the title of the graph. Paste result.



c) Change the reducer of the graph to extract the median. Change the Y axis title to Median reflectance. Paste result.



d) Change the palette so that each fraction has a different color (e.g. vegetation: green, bare: red and water: blue). Paste the fraction images and interpret each of them.

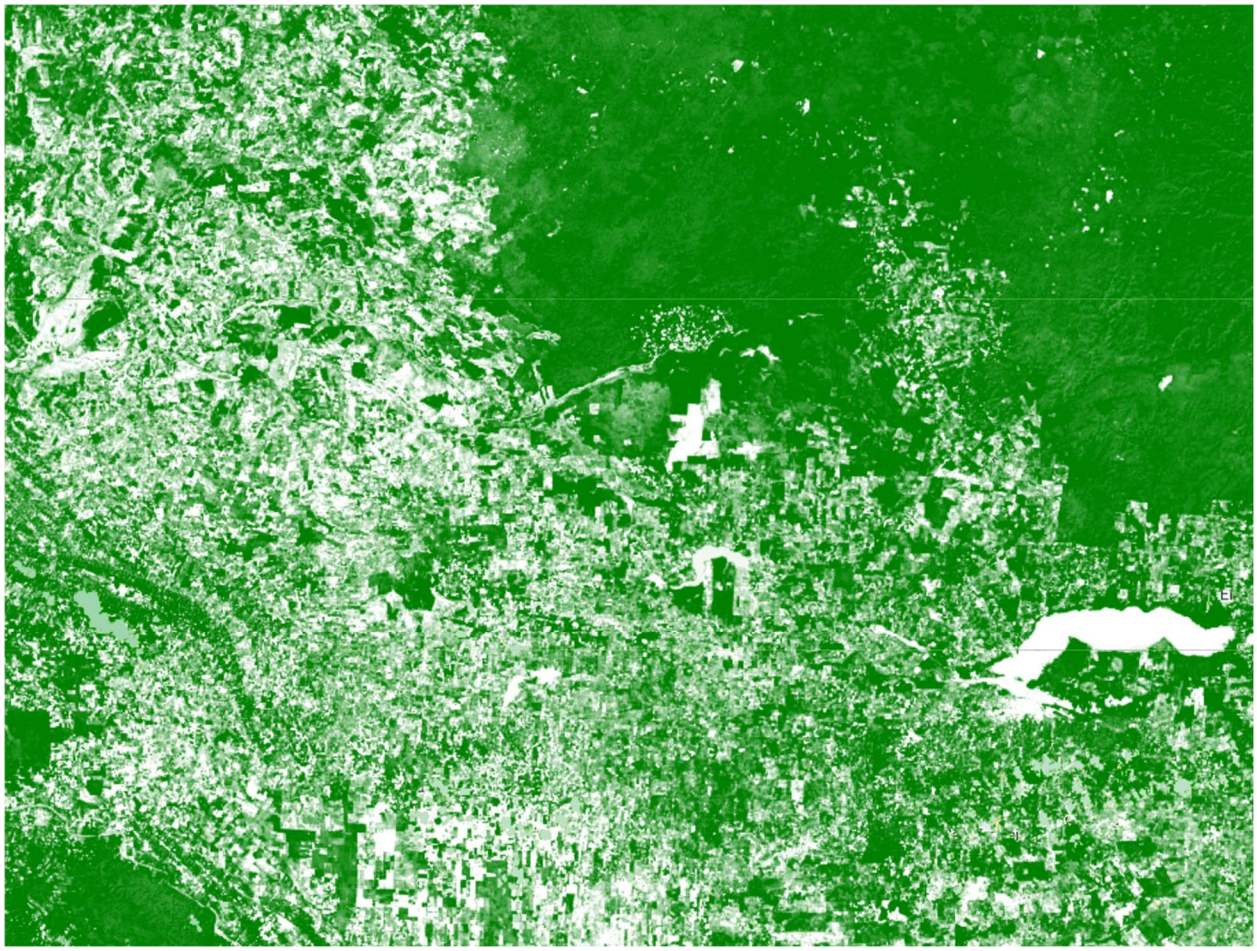


Image 1: Vegetation Fraction

This layer displays the distribution and density of vegetation. Darker green areas with higher values represent regions with dense vegetation cover, like forests, while lighter green to white areas with lower values indicate regions with sparse or minimal vegetation to no vegetation.

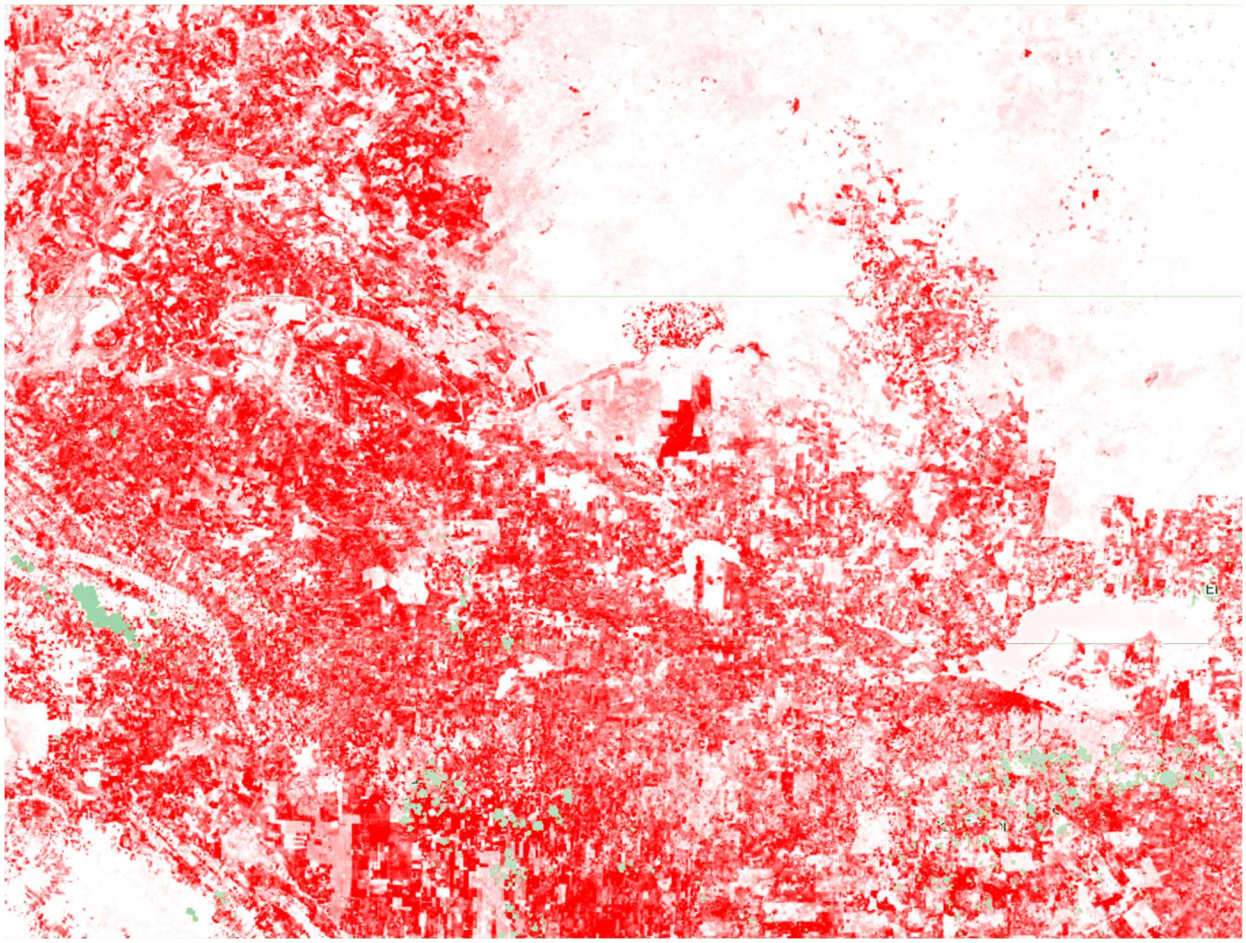


Image 2: Bare Soil Fraction

This layer illustrates the distribution and extent of bare soil. Darker red areas (higher values) represent exposed land without vegetation or with little vegetation, such as cultivated or non-cultivated land, or open terrain. Lighter red to white areas (lower values) suggests places with less expose soil, likely covered by vegetation or water.

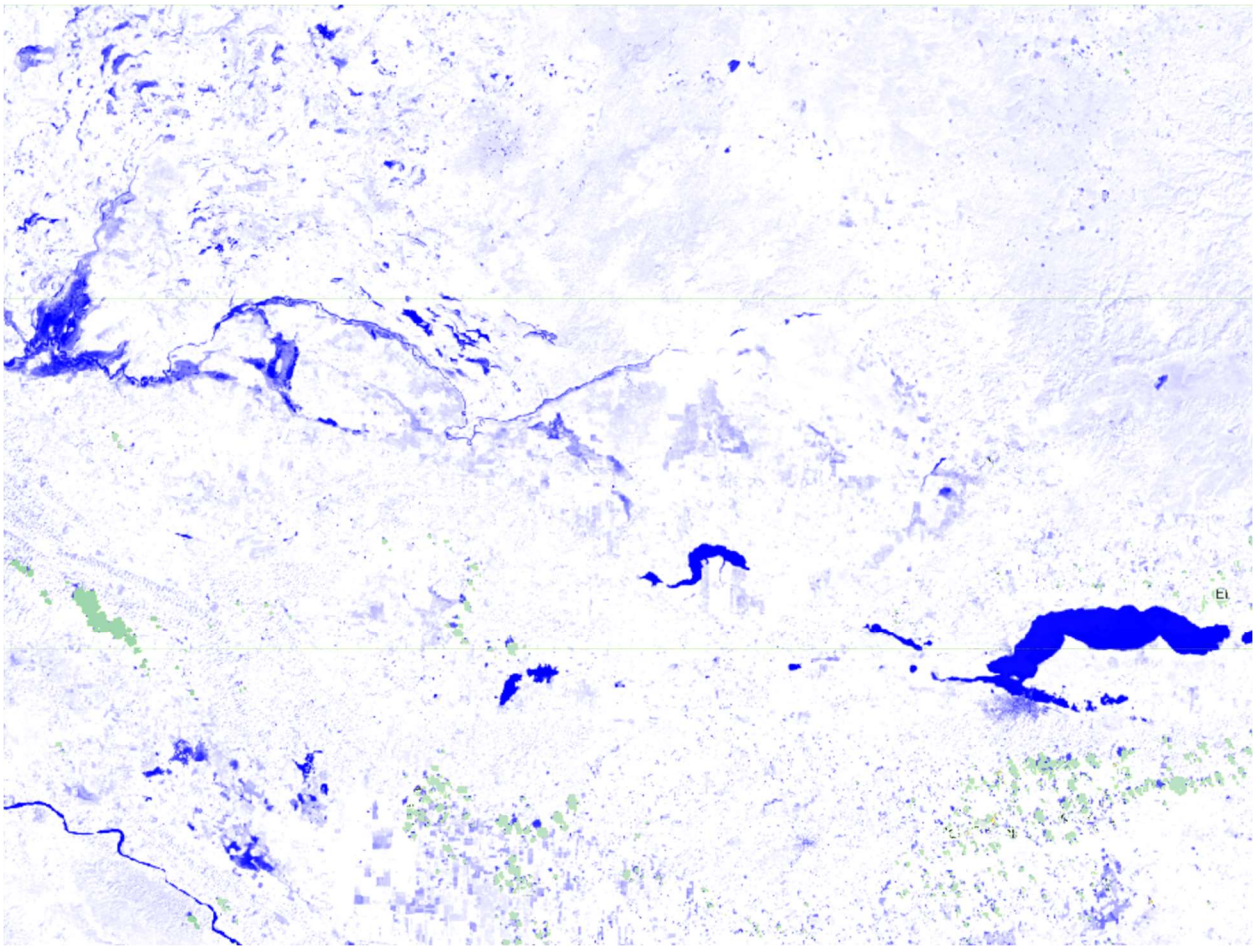
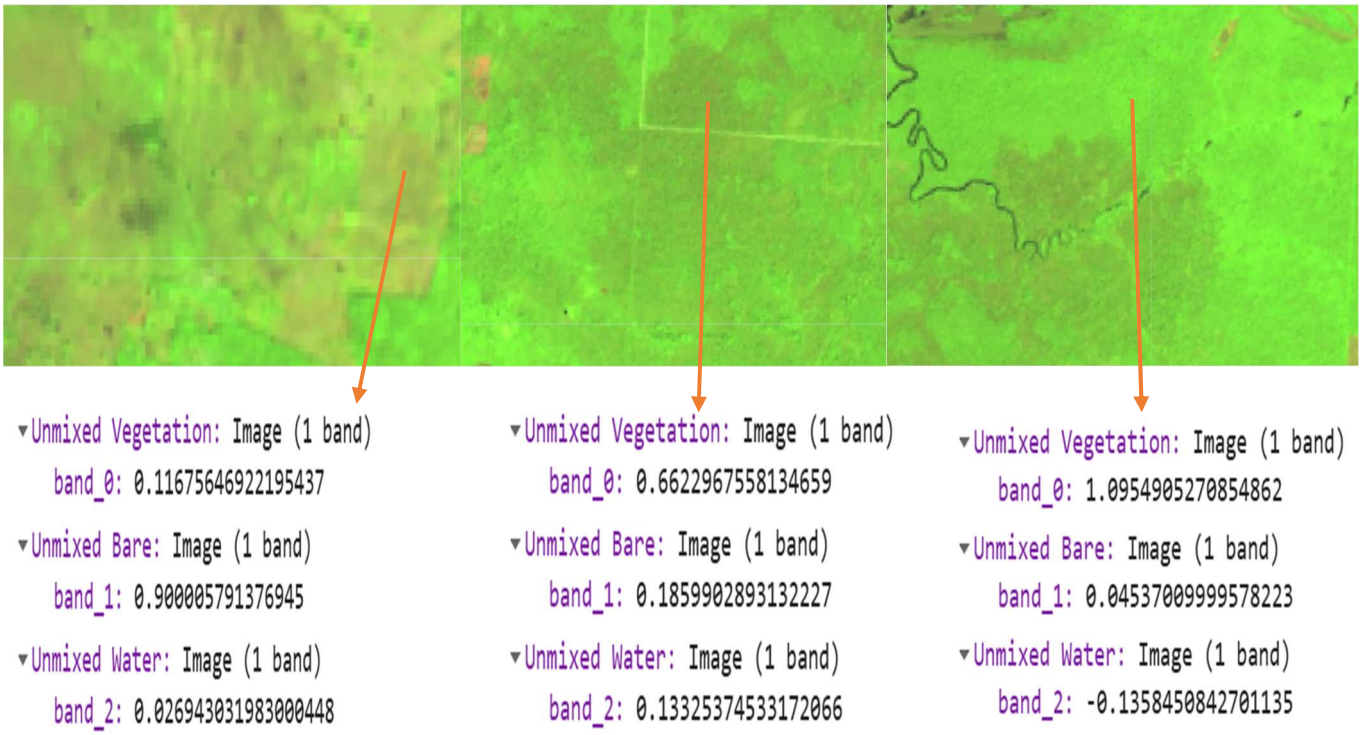


Image 3: Water Fraction

This layer illustrates the distribution of water bodies. Darker blue shades (higher values) represent significant water features, like rivers, lakes, ponds or streams, while lighter blue to white areas (low values) indicate wetland or marshy land or dry areas.

e) Using the color composite as a reference and the inspector tool, extract the fraction values for an area of different degrees of vegetation growth (e.g. search for areas of agriculture).



The image above is a false color composite. The first point is highlighting low vegetation area and the vegetation fraction is roughly 0.12. In the 2nd point vegetation fraction is around 0.67, meaning the area is covered by moderate vegetation. In the third point, vegetation fraction is 1.09 which indicating this area is covered by dense forest or vegetation.

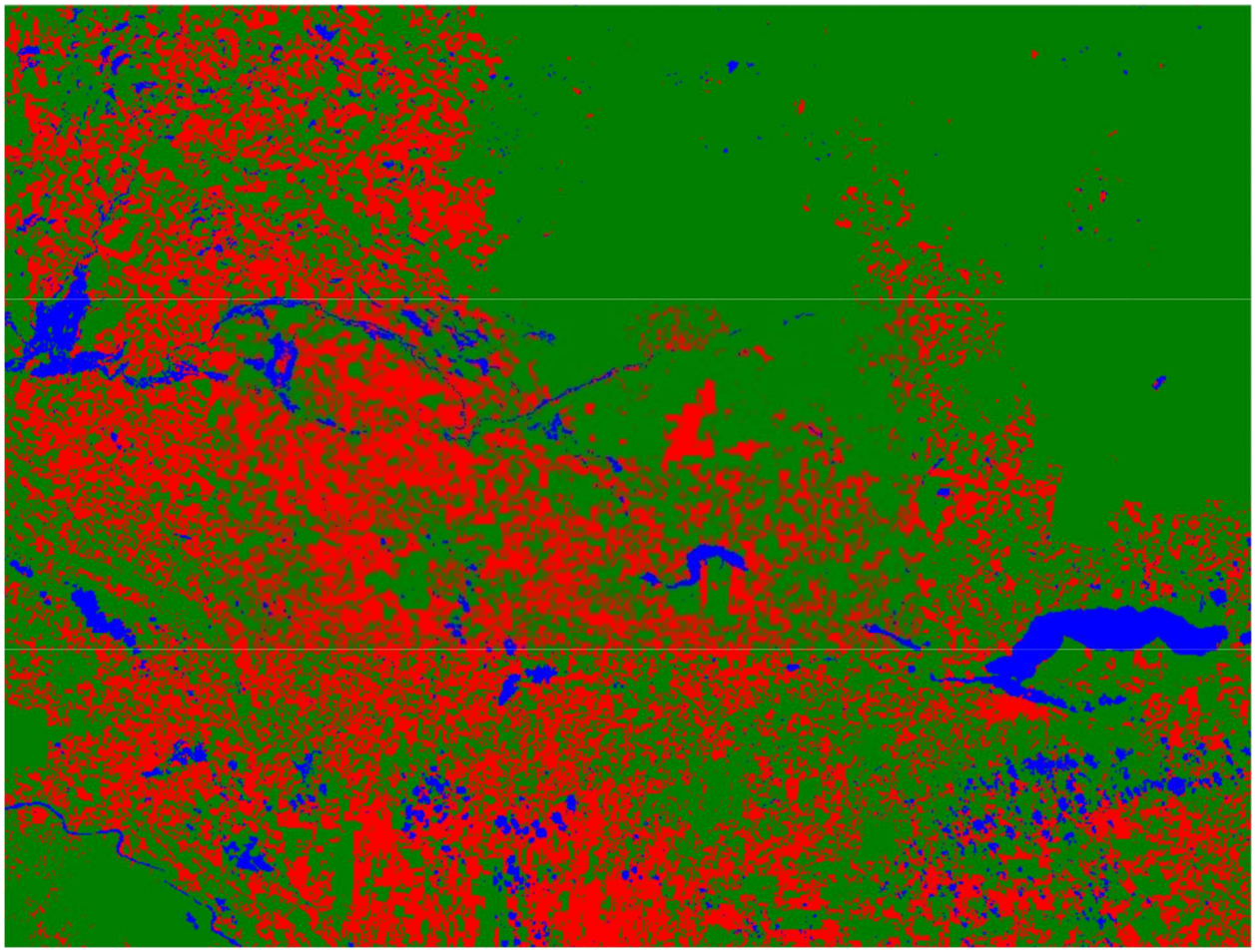
f) How can spectral unmixing results be used to make inferences about the environment?

Spectral unmixing in remote sensing breaks down mixed pixels in multispectral or hyperspectral images into pure components, known as "endmembers" (e.g., water, vegetation, soil), and calculates their proportions within each pixel. This analysis reveals pixel composition and has broad applications in environmental monitoring and assessment. In our study, it aids in assessing vegetation density, identifying bare soil, and detecting distribution of water bodies. This detailed information supports monitoring of environmental changes over time, such as deforestation,

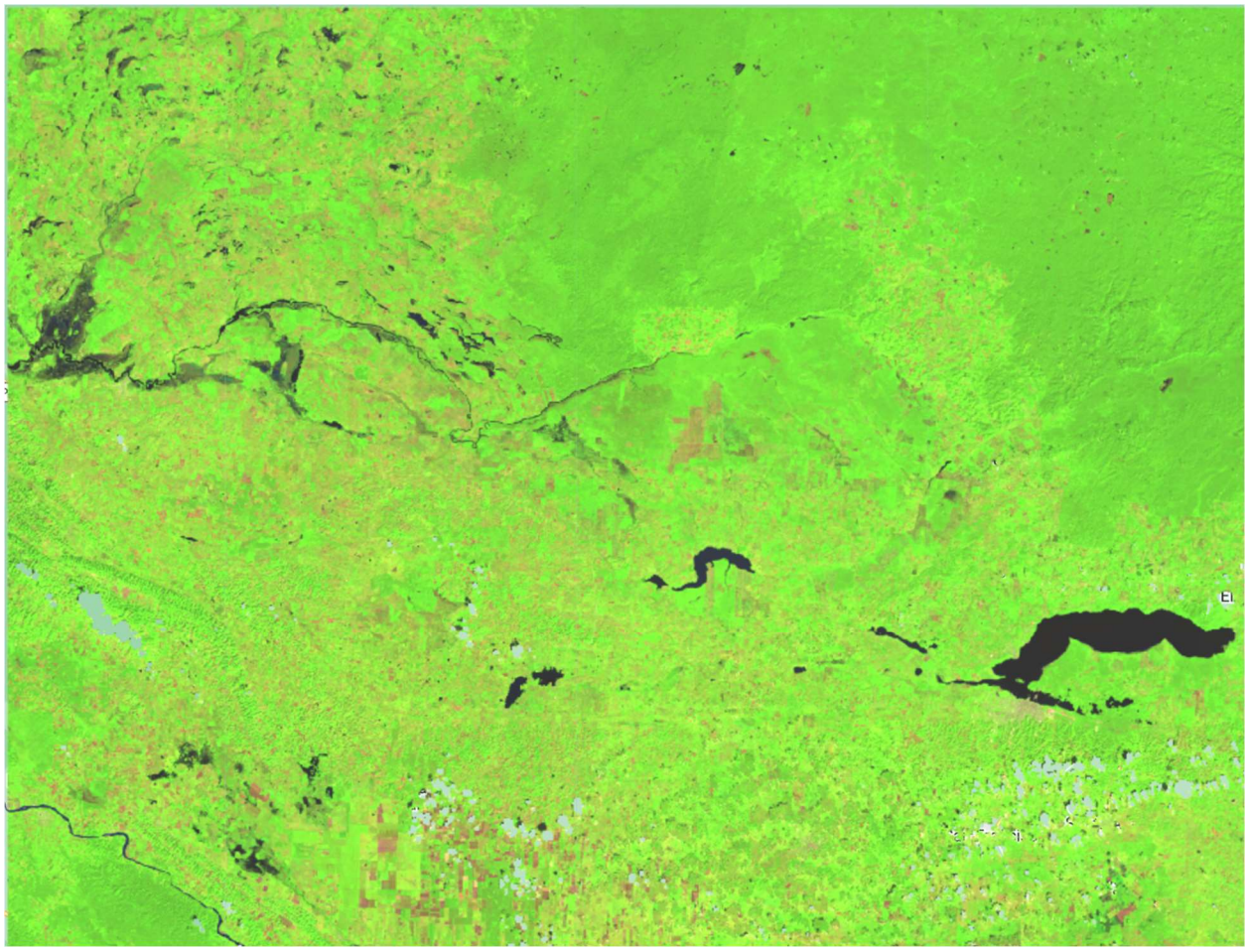
urbanization, or shifts in water resources, and helps evaluate ecosystem and habitat change, by examining the balance among various kinds of land covers.

g) How can the fractions of endmembers be used to transform the results to a hard classification land cover?

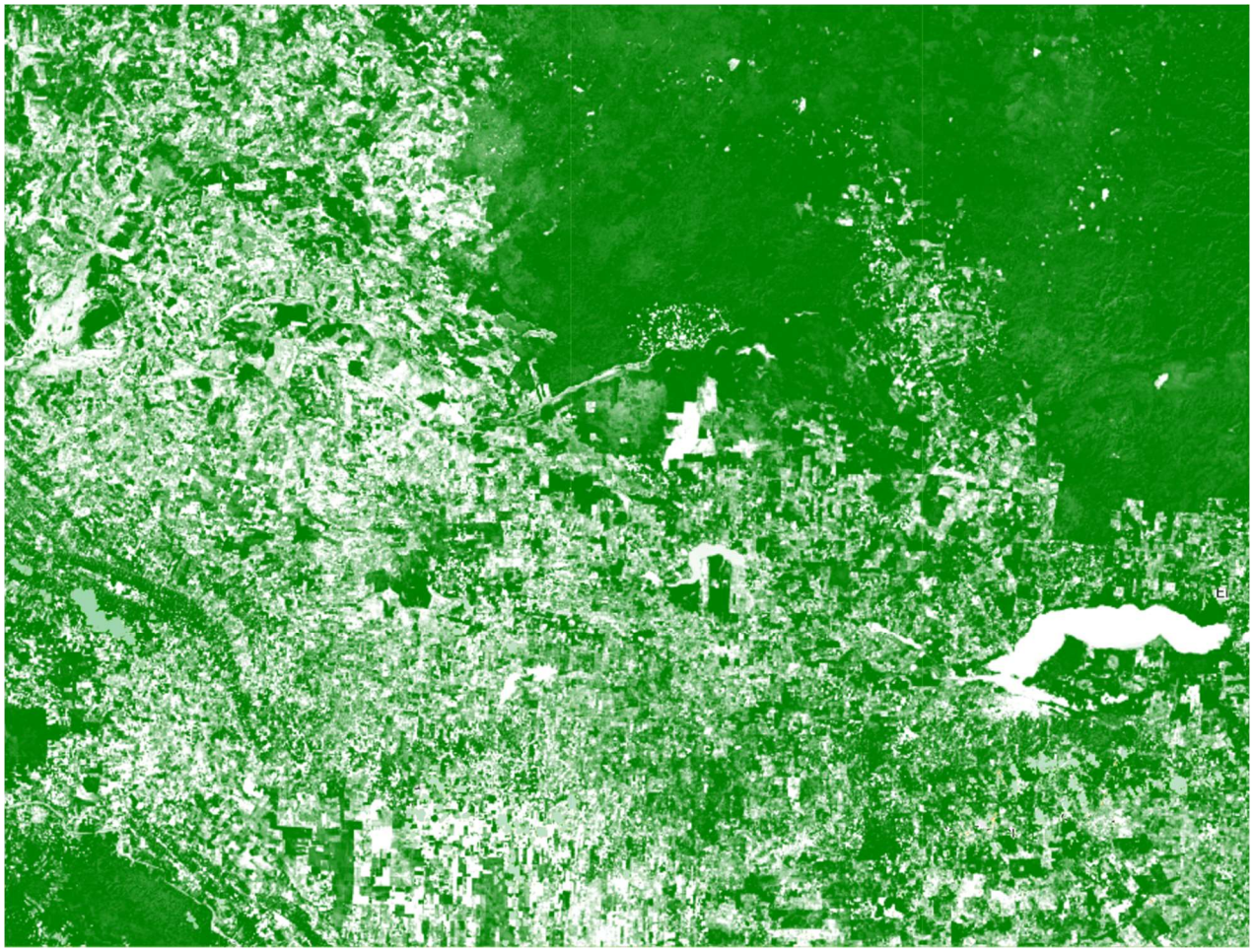
To create a hard classification land cover map from the fractional results, each pixel is assigned to the class with the highest endmember fraction, such as vegetation, bare soil, or water. This gives a clear and simple map of land cover, which helps track environmental changes and study the landscape composition and pattern over time. The image below shows the hard classification land cover map for the study area based on the dominant endmember fractions.



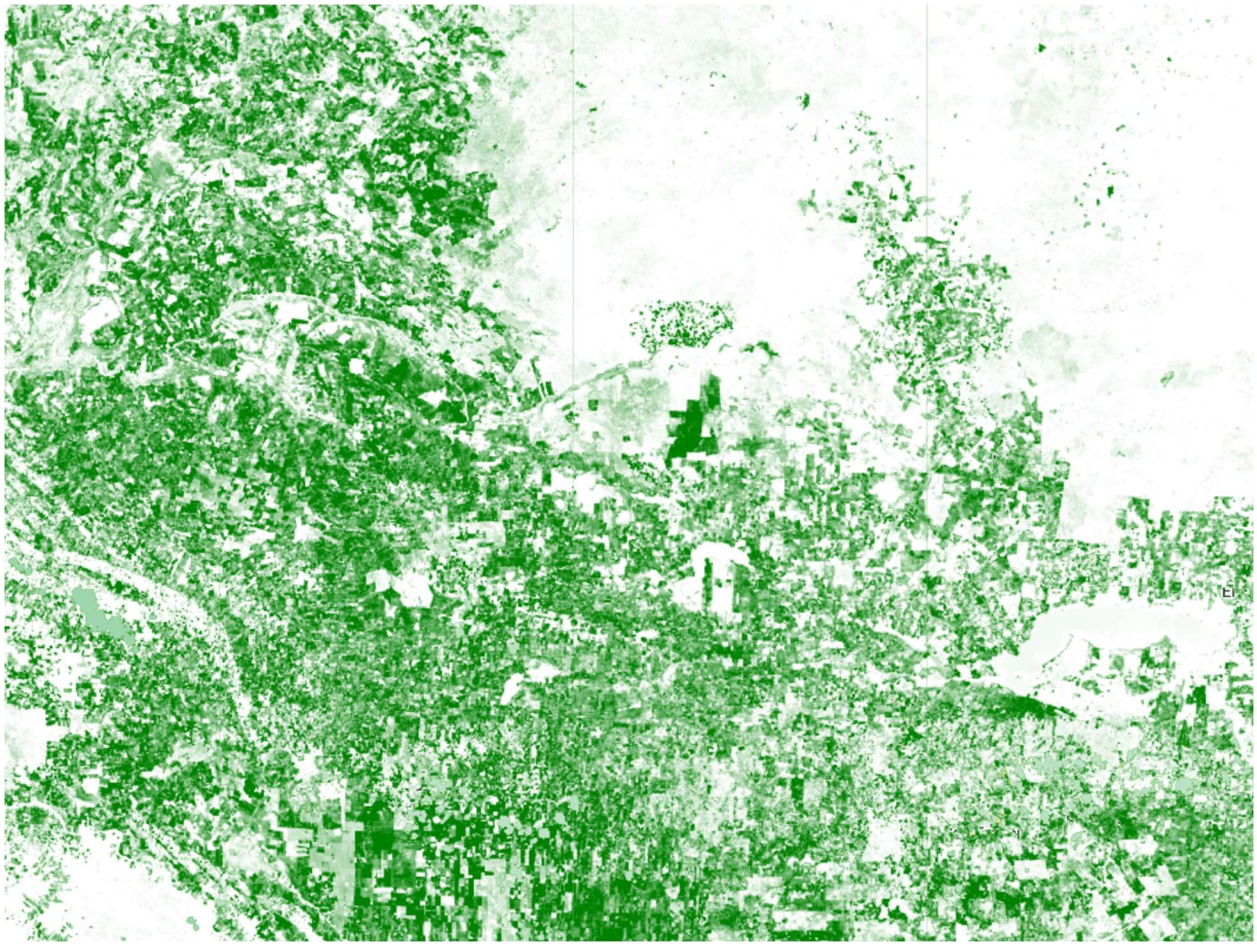
Map output



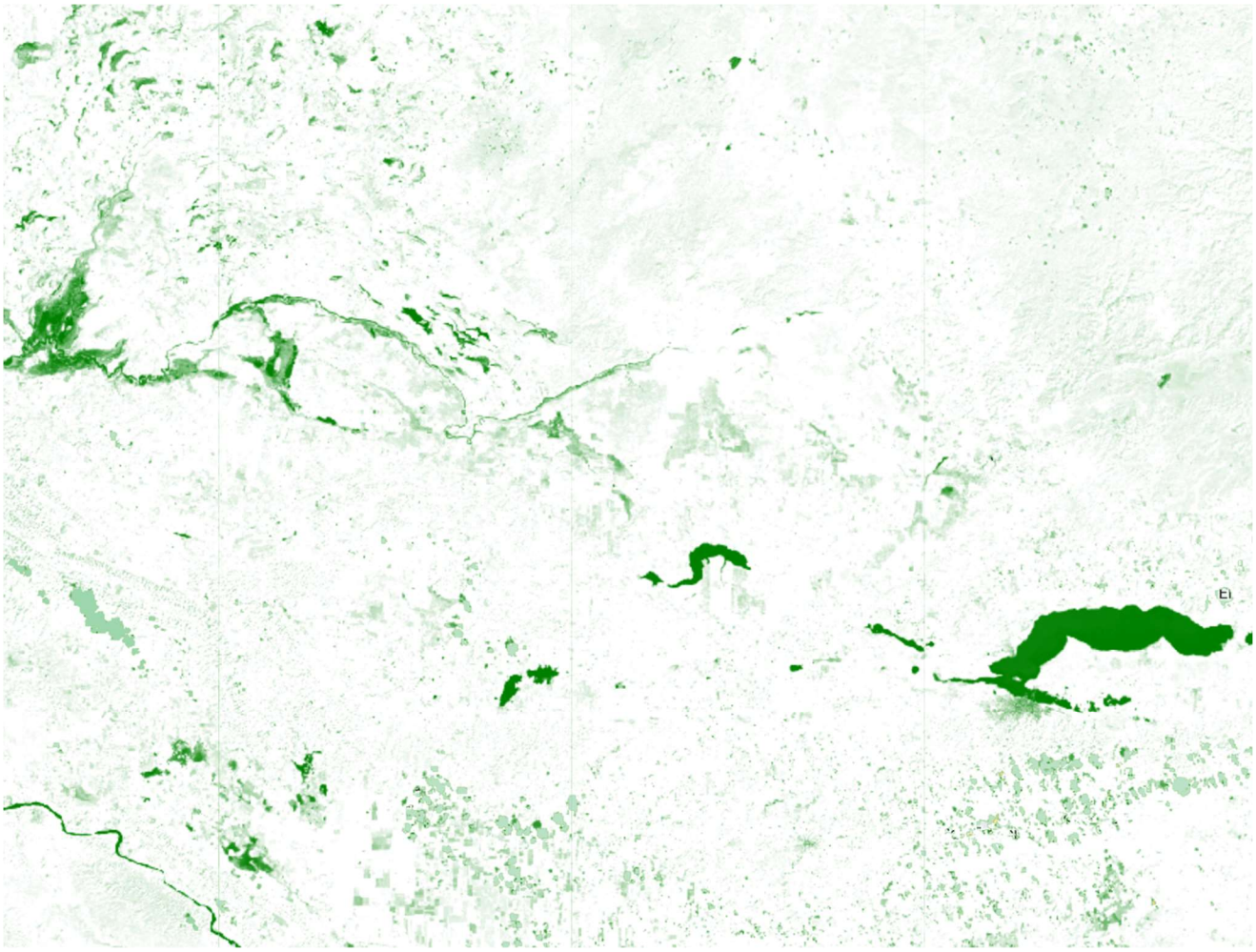
Map 1: Median Cloud Masked False Color image



Map 2: Unmixed Vegetation, palette (White, Green)



Map 3: Unmixed Bare, palette (White, Green)



Map 4: Unmixed Water, palette (White, Green)