

Deforestation and Fragmentation of the Atlantic Forest

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Abstract

The Atlantic Forest, which extends over 17 Brazilian States, is one of the richest biomes in the world. Despite this, only 15% of the forest’s original range remains. This loss is disproportionately distributed as 4 of the 17 states accounts for 90% of the loss. We are focusing on acquiring images from the southern region of the forest extent in the state of Rio Grande de Sol. Through using public geodatabases, satellite imagery, and ArcGIS Pro we will attempt to identify changes in the forest range from 1994 to 2004 in a visually accessible way.

Background

Deforestation and forest fragmentation can primarily be attributed to the increase of anthropogenic activity throughout Brazil over the past decades. More specifically, the changes in forest cover can be attributed to large expansions of logging developments and eucalyptus plantations. This loss in range has great implications ecologically to the region as it has been a hot spot for important biodiversity including endangered and endemic species.



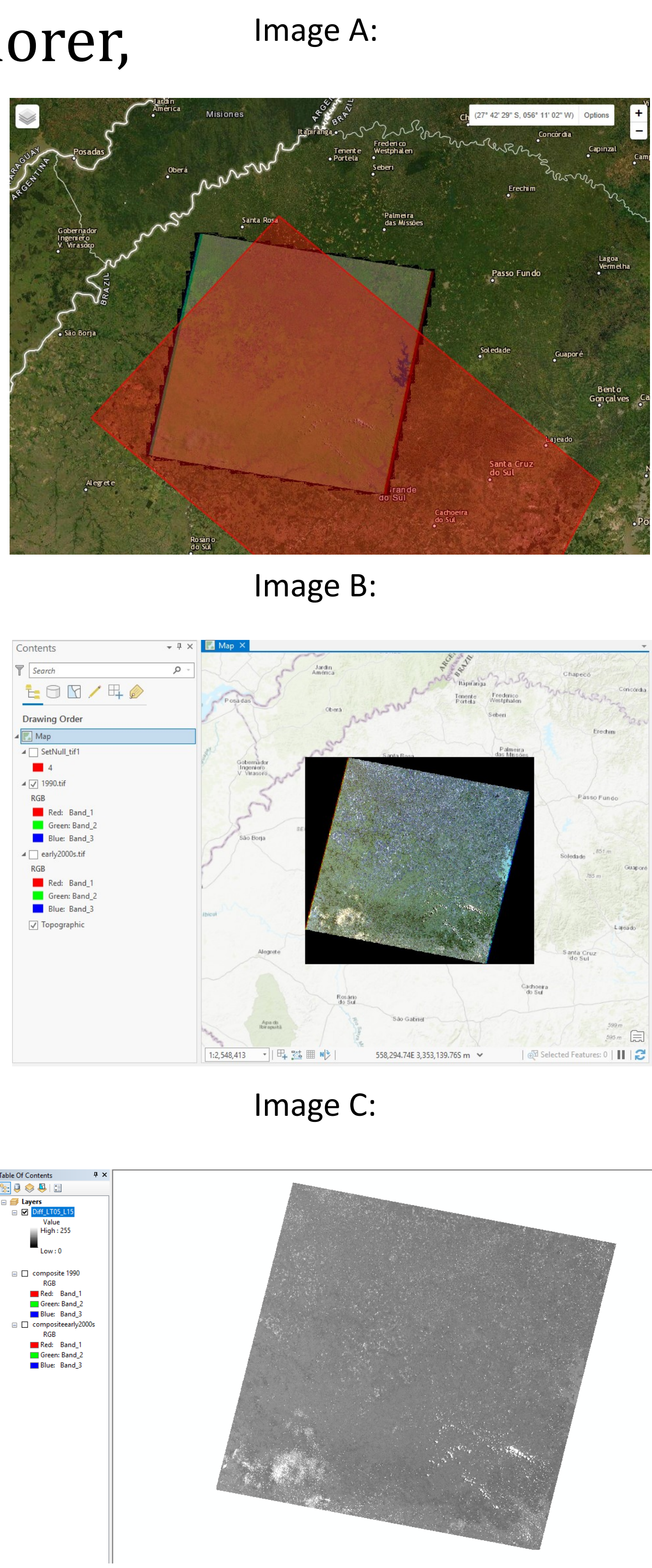
Figure 1: Image shows original range of the Atlantic Forest. Red box indicates the region of interest for this study and where the satellite images were acquired. Source: <https://www.treehugger.com/natural-science-4846041>

Objective

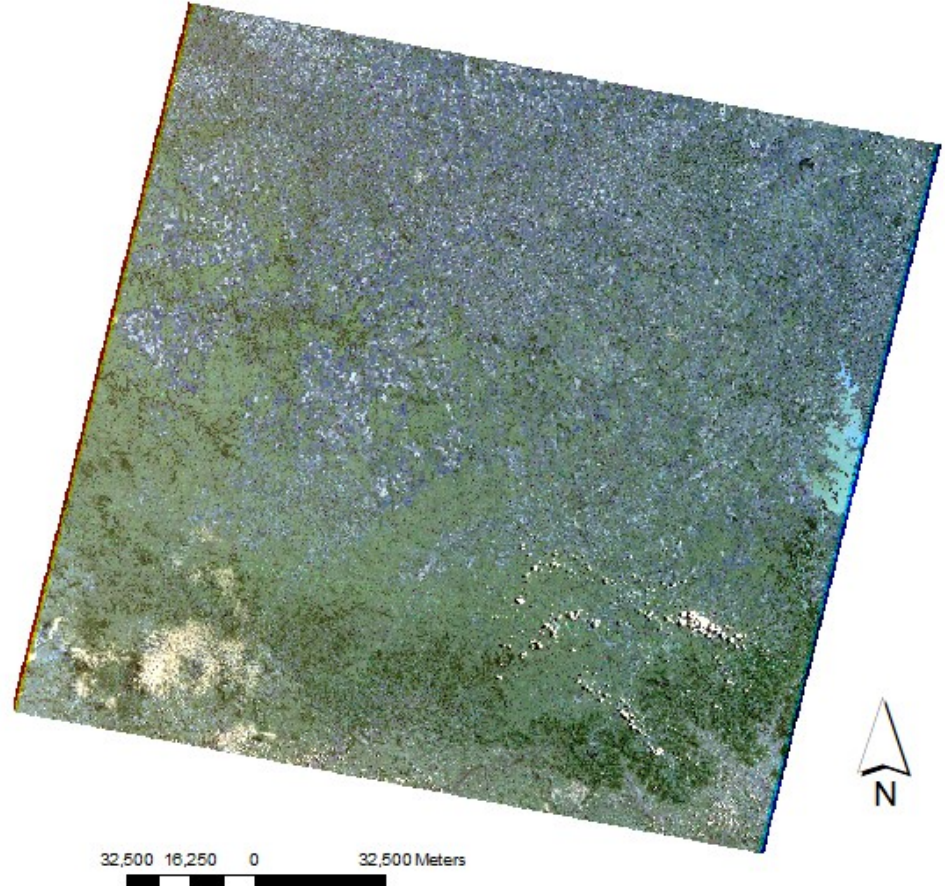
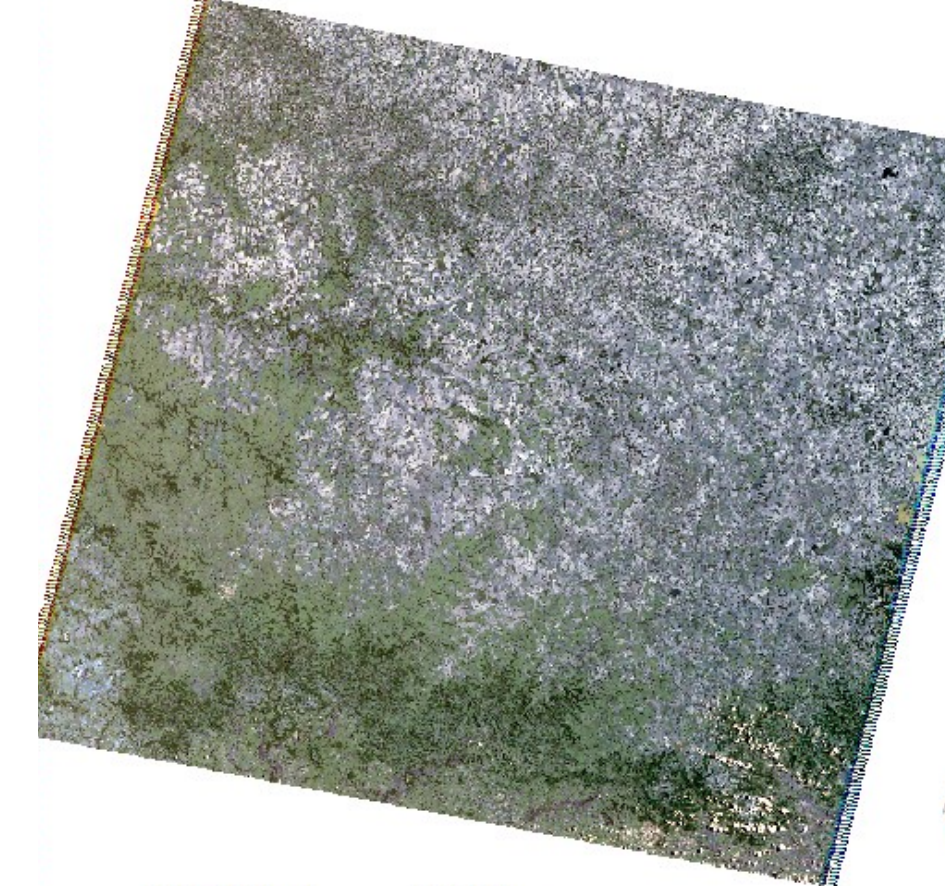
Our objective is to identify the extent of deforestation in the southern region of Brazil and any impact of re-forestation efforts.

Method

- We acquired two images from Earth Explorer, USGS from 1994 and 2004 respectively (see image A).
- We then uploaded the satellite images to ArcGIS Pro and created composite images (see image B).
- The composites were then uploaded to ArcMap and a difference image was created (see image C).
- The unsupervised classification tool was then used on the difference image with 6 categories.
- The category representing deforestation was isolated and the other categories were removed.
- The resulting layer illustrating deforestation was then overlaid on the early 2000s composite image to give visual reference on where the deforestation has occurred. (see results, figure 4).



Data

Image	Satellite	Date	Criteria
	Landsat 4-5	1994-10-27	<ul style="list-style-type: none">•low cloud cover•Southern region of Atlantic forest•Overlap with 2004 image
	Landsat 4-5	2004-11-07	<ul style="list-style-type: none">•low cloud cover•Southern region of Atlantic forest•Overlap with 1990 image

Result

- In comparing the 1994 composite image, shown in figure 2, and the 2004 composite image, shown in figure 3, significant change in forest cover was detected.
- Final calculations show the total area deforested over the ten year time span, designated by the red coloration in figure 4, is **6,611.38 square miles**.
- After closer inspection of the area deforested we conclude the primary driver of this deforestation is conversion of the land for agriculture.
- The deforestation appears to be more concentrated in the bottom half of the image likely due to larger farming operations.
- No areas of reforestation during this time period were detected.

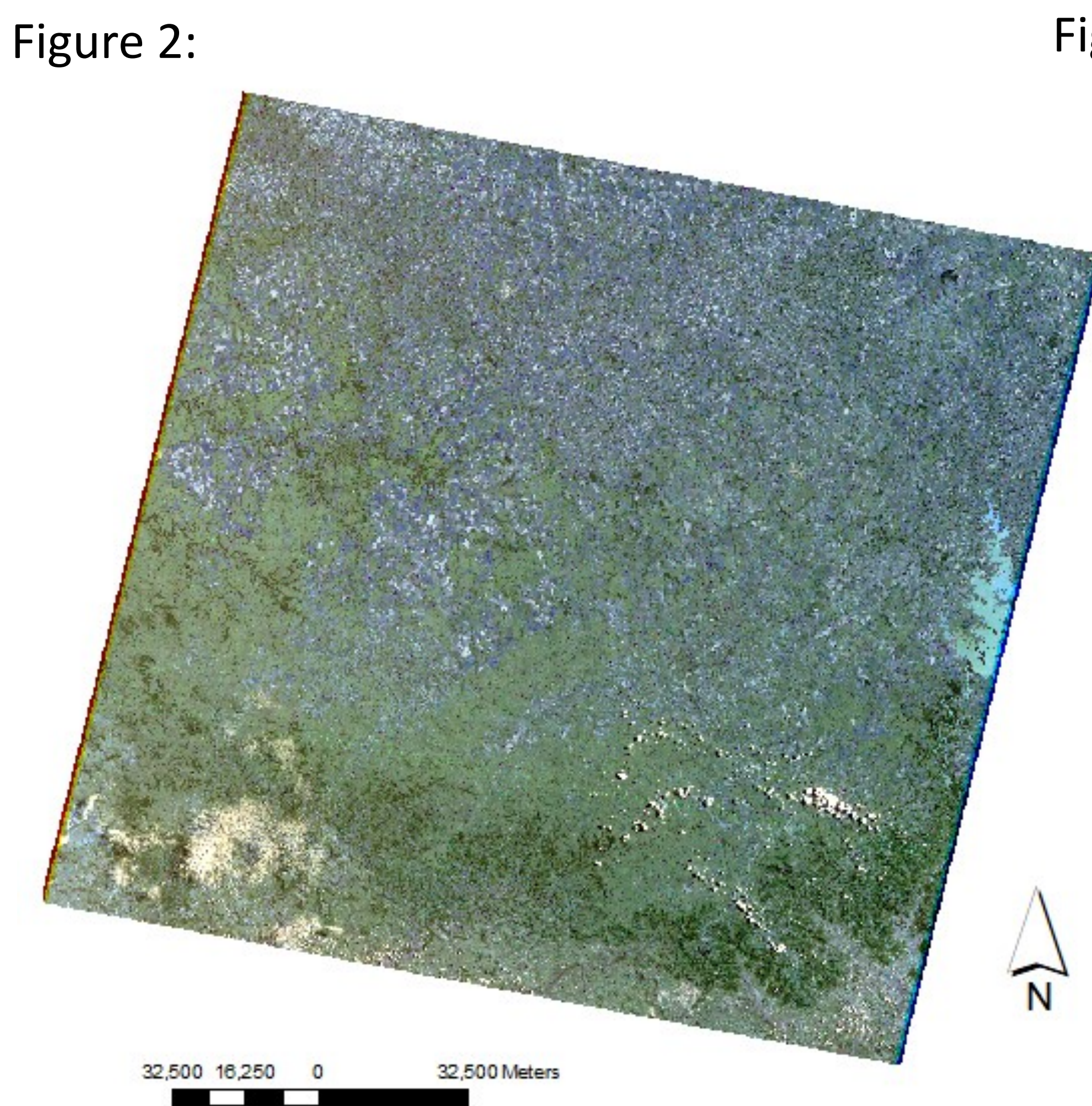


Figure 2: Composite image of area of interest from 1994. Taken from Landsat 4-5.

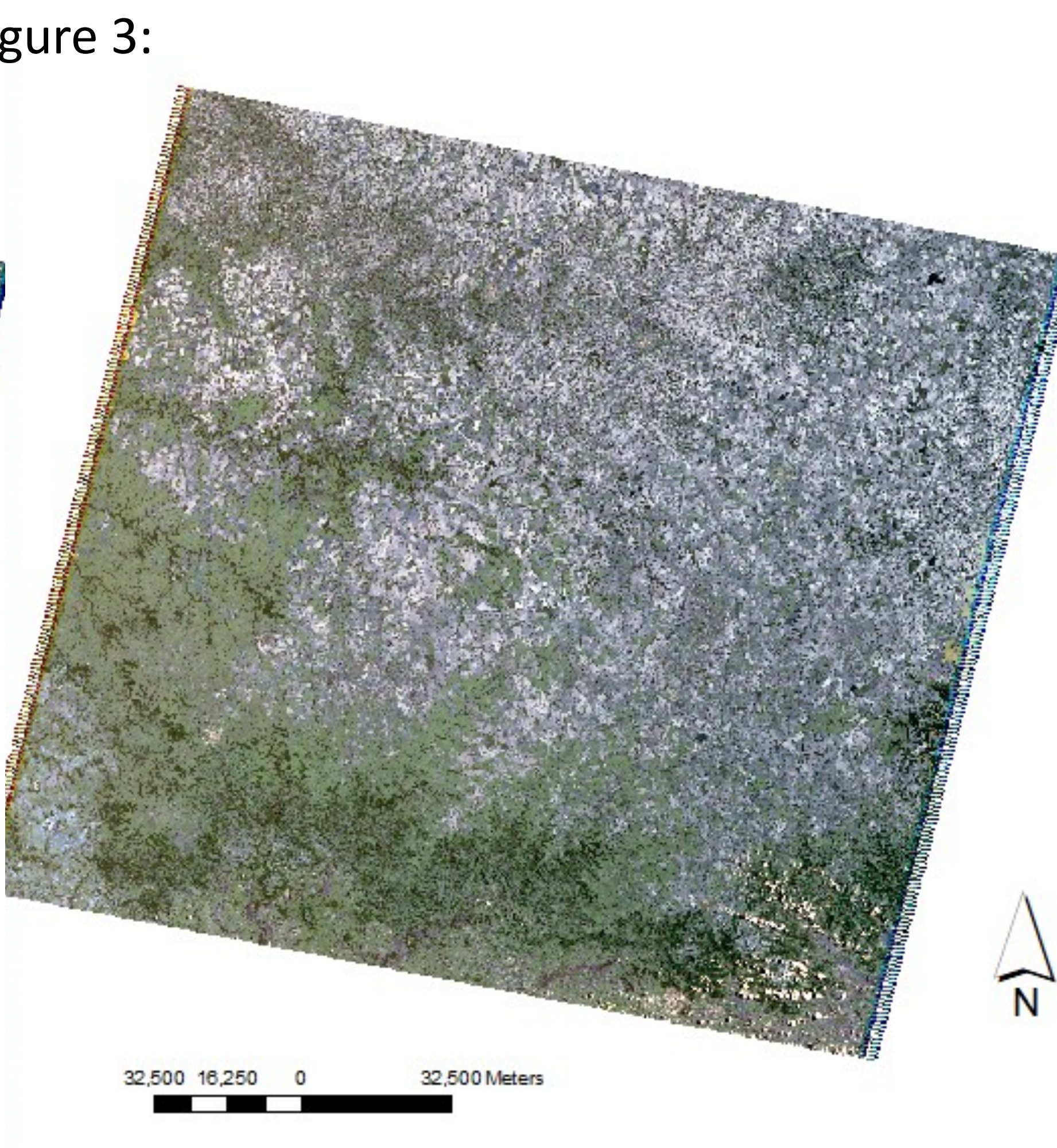


Figure 3: Composite image of area of interest from 2004. Taken from Landsat 4-5.

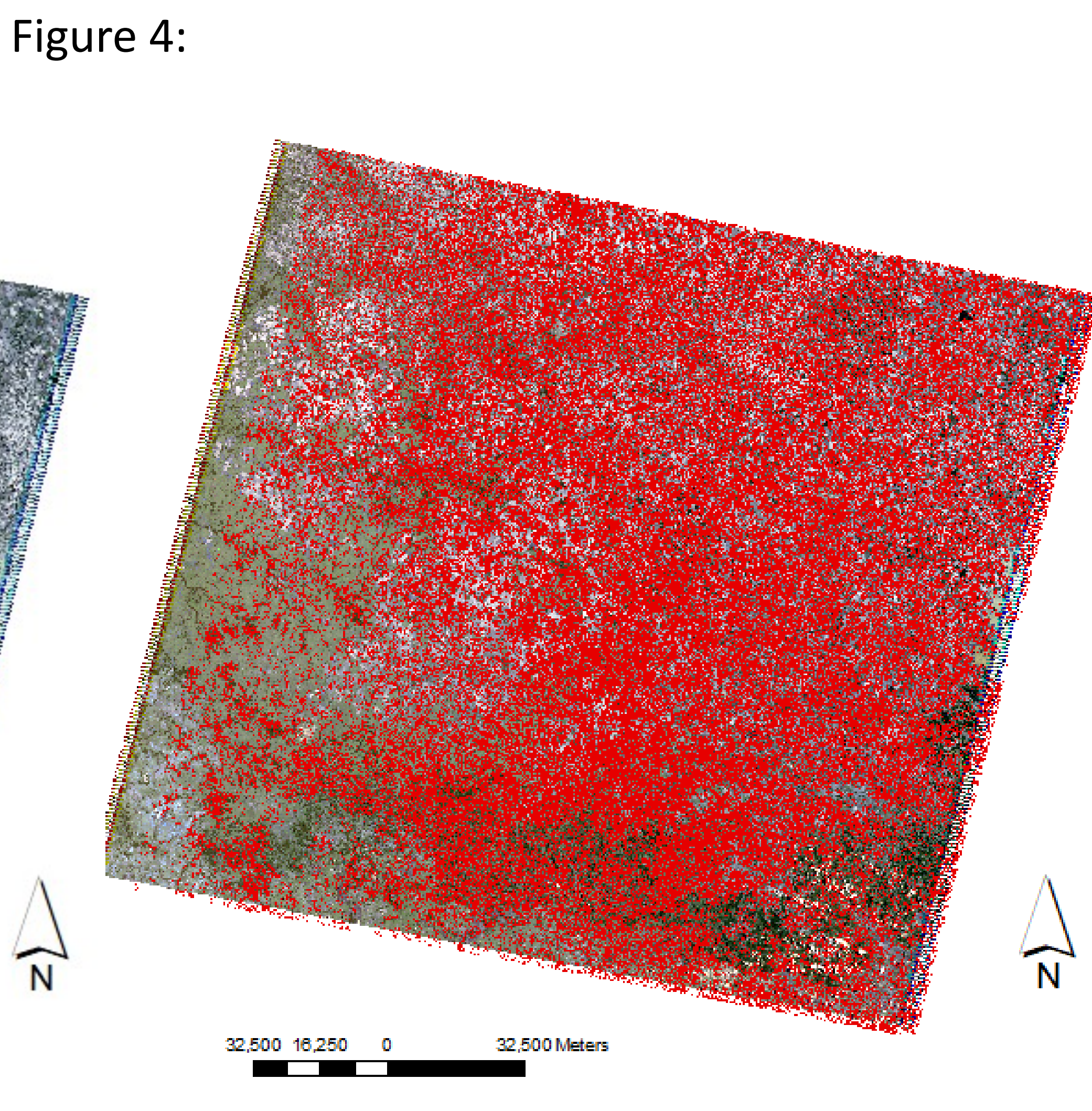


Figure 4: Overlay of difference image, that shows deforestation designated by the red color, and the 2004 composite.

Conclusion

Based on the results of this study, significant deforestation has been detected in the southern region of the Atlantic Forest. The primary driver of this deforestation is conversion of land for agriculture. If this vital ecosystem and the biodiversity it supports is to be preserved, we suggest stronger regulations to limit deforestation moving forward and initiate reforestation efforts.