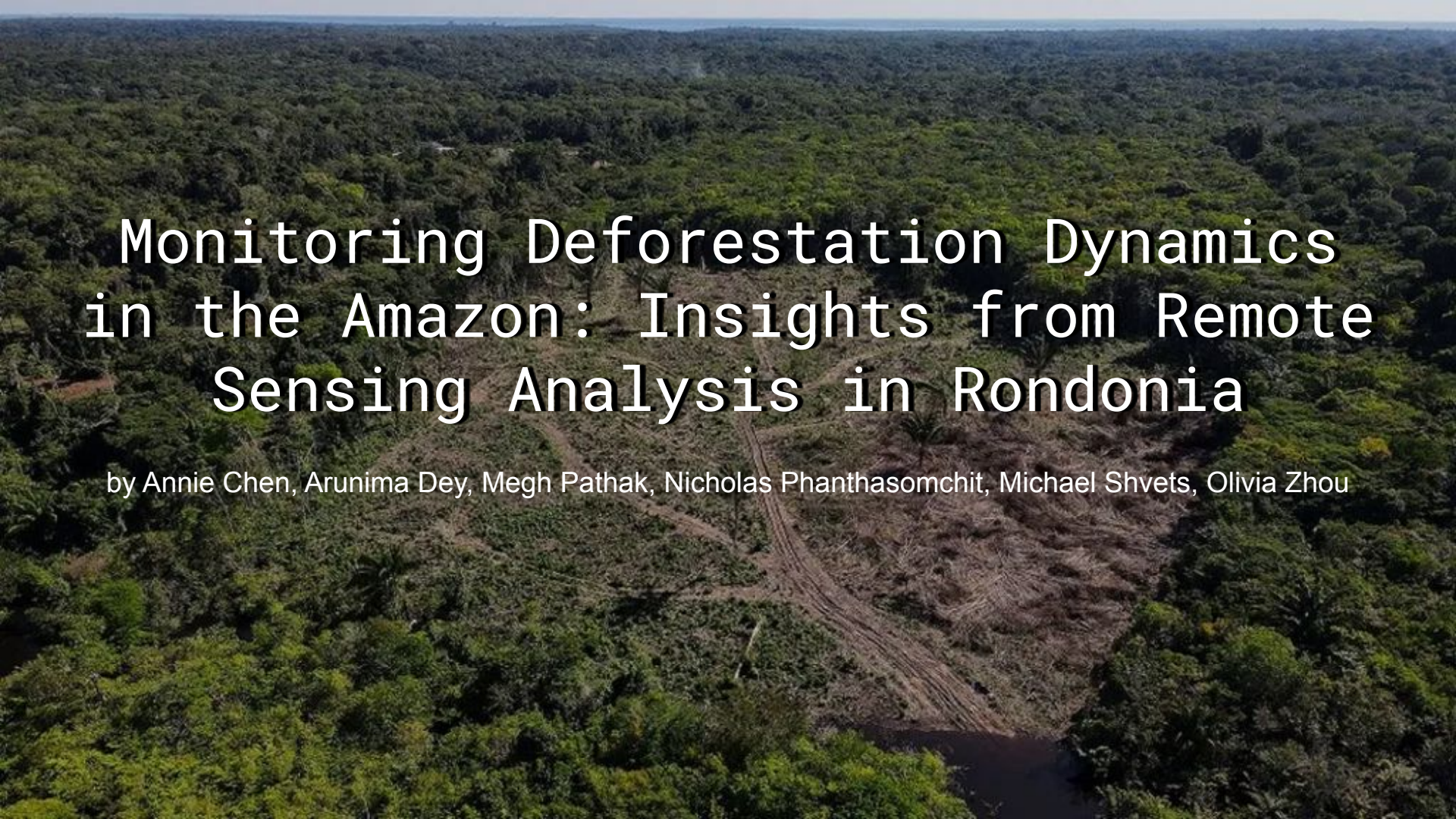


Monitoring Deforestation Dynamics in the Amazon: Insights from Remote Sensing Analysis in Rondonia

by Annie Chen, Arunima Dey, Megh Pathak, Nicholas Phanthasomchit, Michael Shvets, Olivia Zhou

Outline

- Background
- Objective
- Methodology
- Key Results
- Conclusion
- Q & A

Background

- Rondonia is a state located in southern Brazil and is part of the Amazonian “arc of deforestation”
- In 2010, it had 16.8 million hectares of natural forest covering 71% of land
- By 2022, it had lost 220,000 hectares, equivalent to 154 million tons of CO2 emissions

Objective

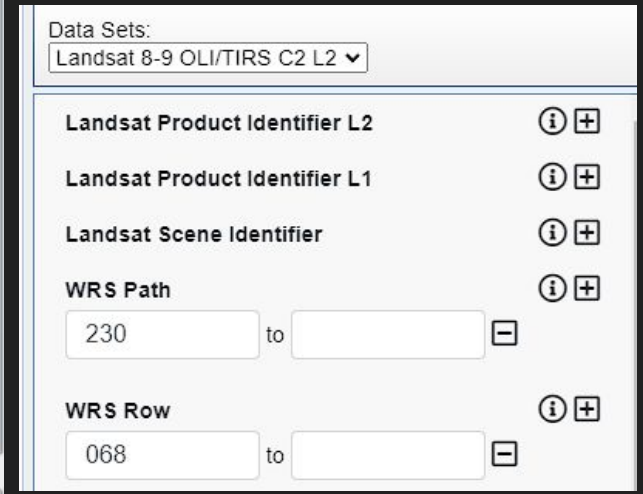
Question

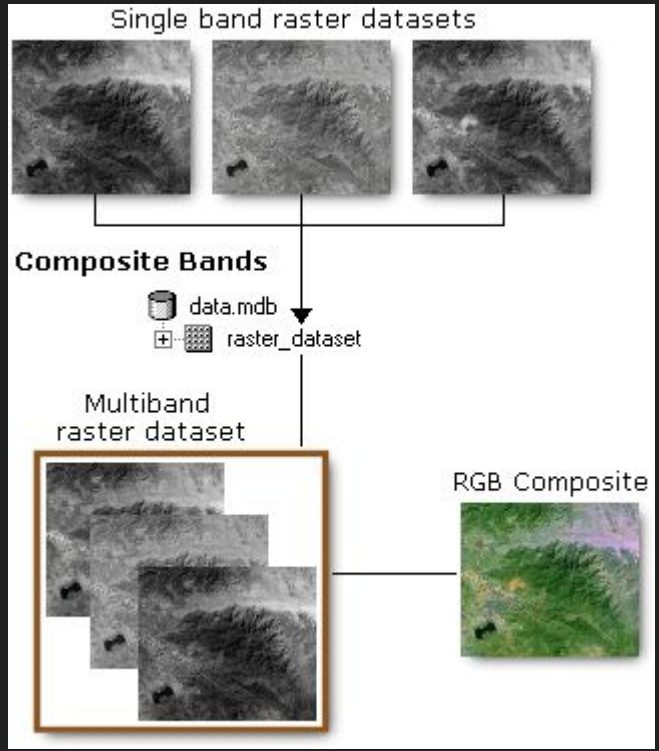
How can remote sensing monitor the rate of deforestation in the Amazon & provide insights into its impacts?

Goal

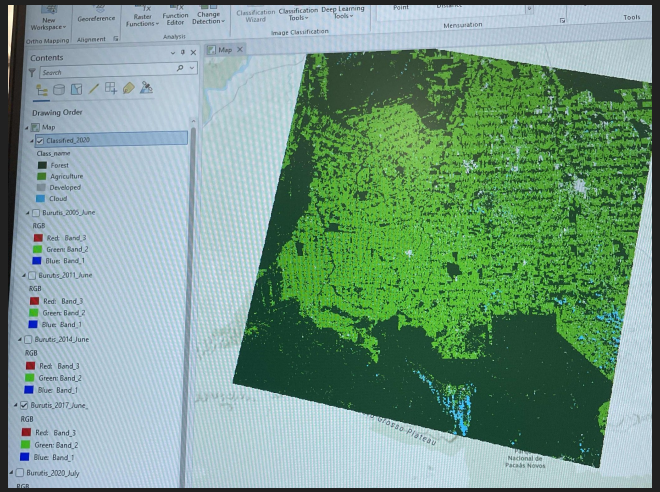
Collect data on spatial & temporal changes to facilitate informed conservation activities, land management strategies, scientific informed perspective on government policy

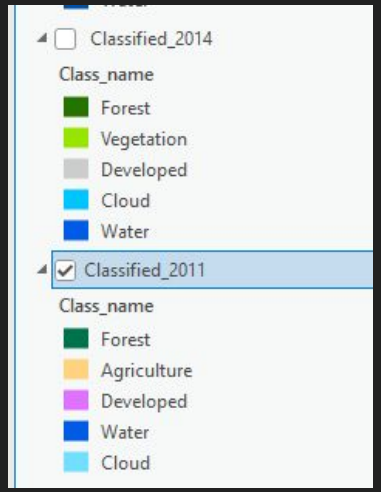
Methodology





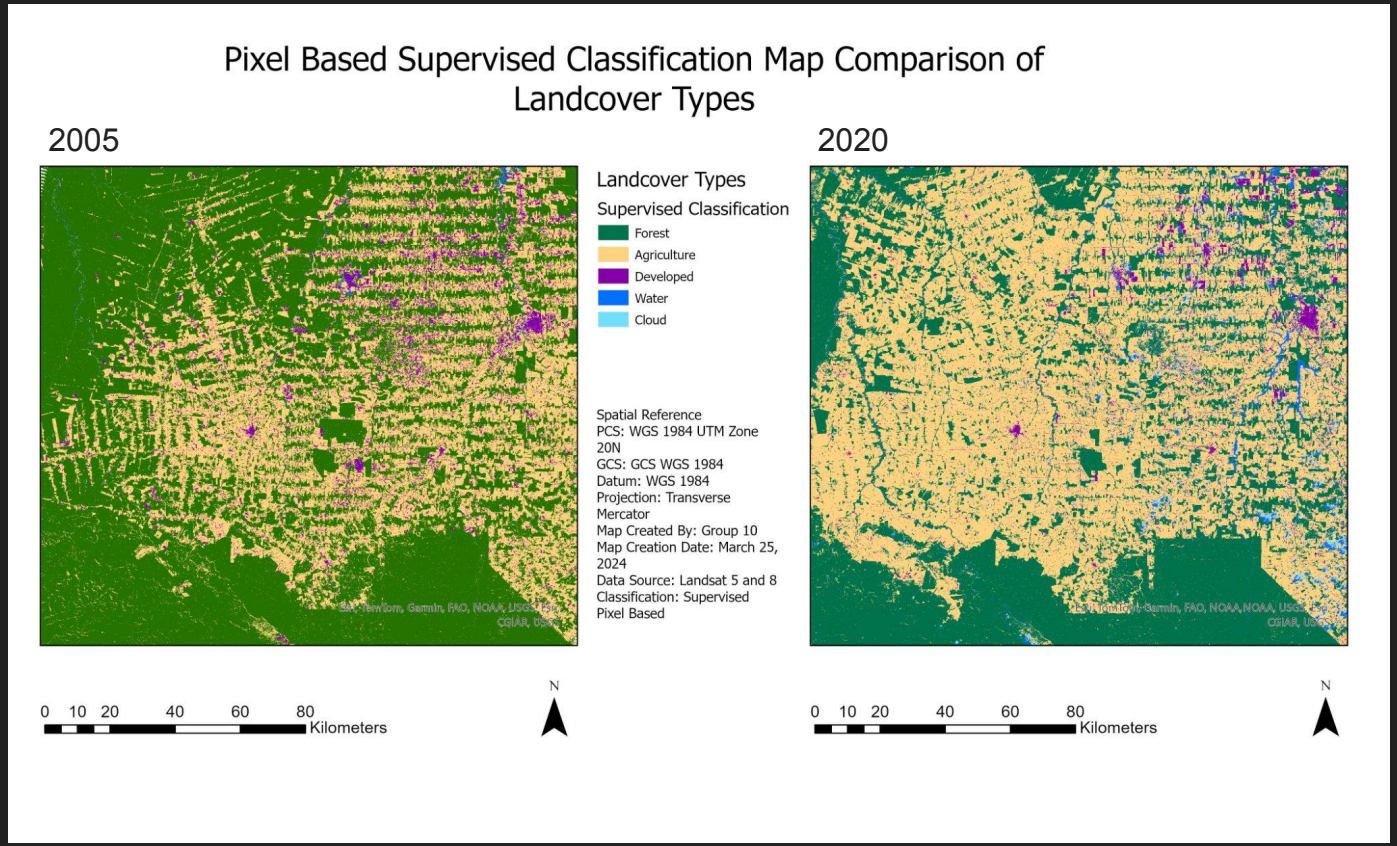
Methodology



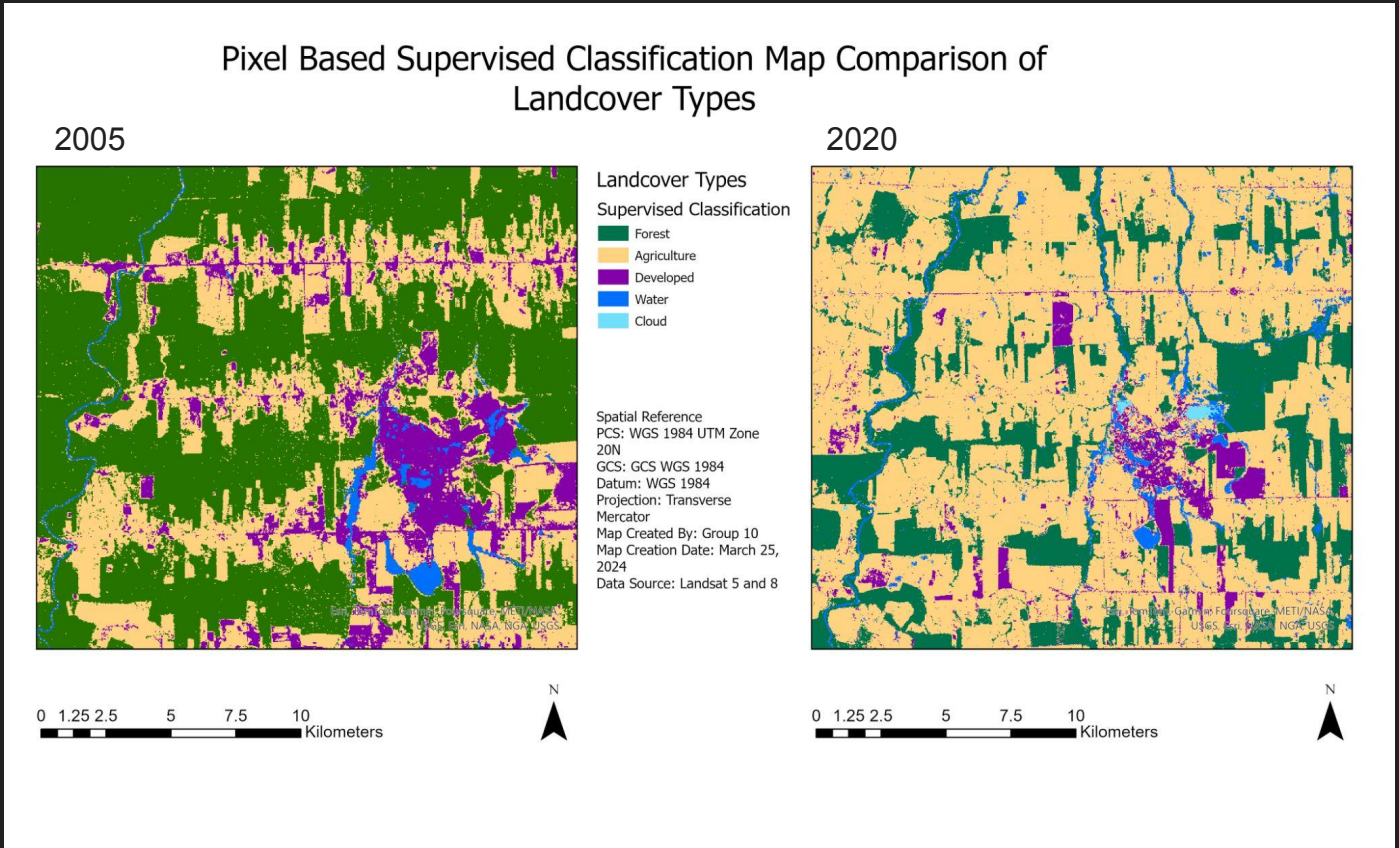



```python
import arcpy
from arcpy.sa import *

def composite_bands(bands_list, out_rast):
    """Script code goes below"""
    comp_band = arcpy.management.CompositeBands(bands_list, out_rast)
    return comp_band

def calc_NDVI(comp_band, out_rast):
    band_NIR = arcpy.Raster(comp_band + "\\" + "Band_4")
    band_Red = arcpy.Raster(comp_band + "\\" + "Band_3")
    rast_NDVI = RasterCalculator([band_NIR,band_Red], ["NIR","Red"], "(NIR - Red
    rast_NDVI.save(out_rast+"_NDVI")
    return rast_NDVI

if __name__ == "__main__":
    bands_list = arcpy.GetParameterAsText(0)

    composite_out = arcpy.GetParameterAsText(1)
    composite_band = composite_bands(bands_list, composite_out)

    raster_NDVI = calc_NDVI(composite_out,composite_out)
    arcpy.SetParameterAsText(1, composite_out)
```

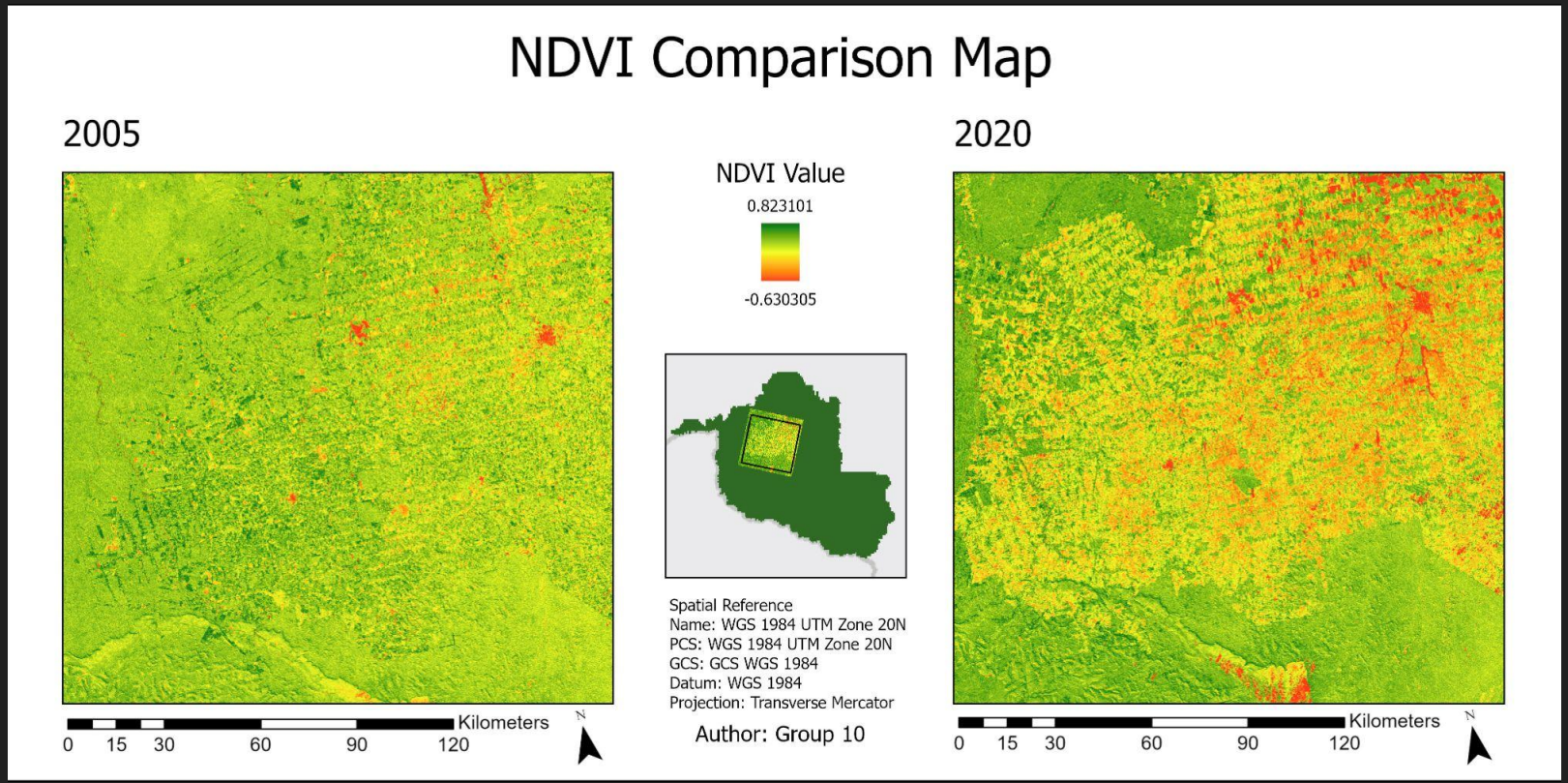
Key Results


Pixel Based Supervised Classification Map Comparison of Landcover Types
2005
2020
Landcover Types
Supervised Classification
Forest
Agriculture
Developed
Water
Cloud
Spatial Reference
PCS: WGS 1984 UTM Zone 20N
GCS: GCS WGS 1984
Datum: WGS 1984
Projection: Transverse Mercator
Map Created By: Group 10
Map Creation Date: March 25, 2024
Data Source: Landsat 5 and 8
Classification: Supervised Pixel Based
0 10 20 40 60 80
Kilometers
N
0 10 20 40 60 80
Kilometers
N

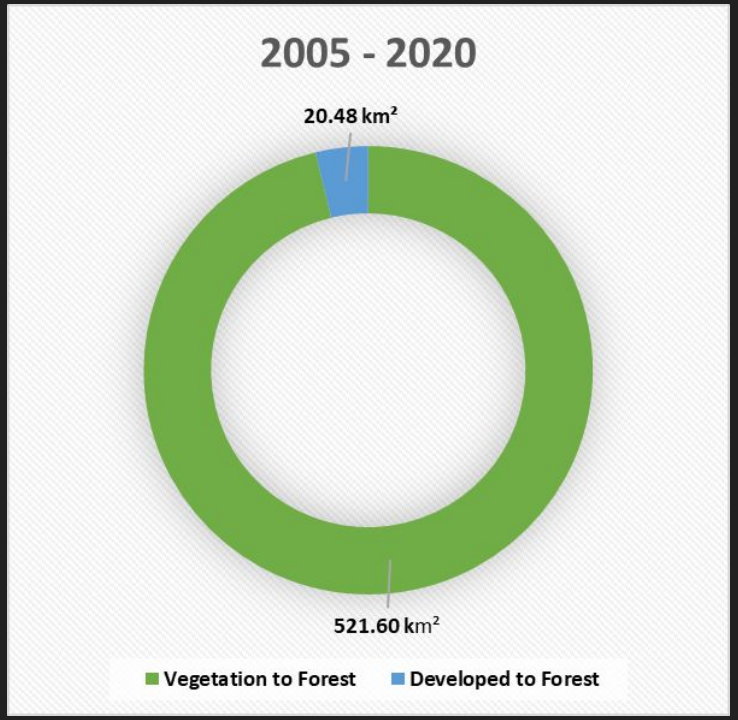
Key Results

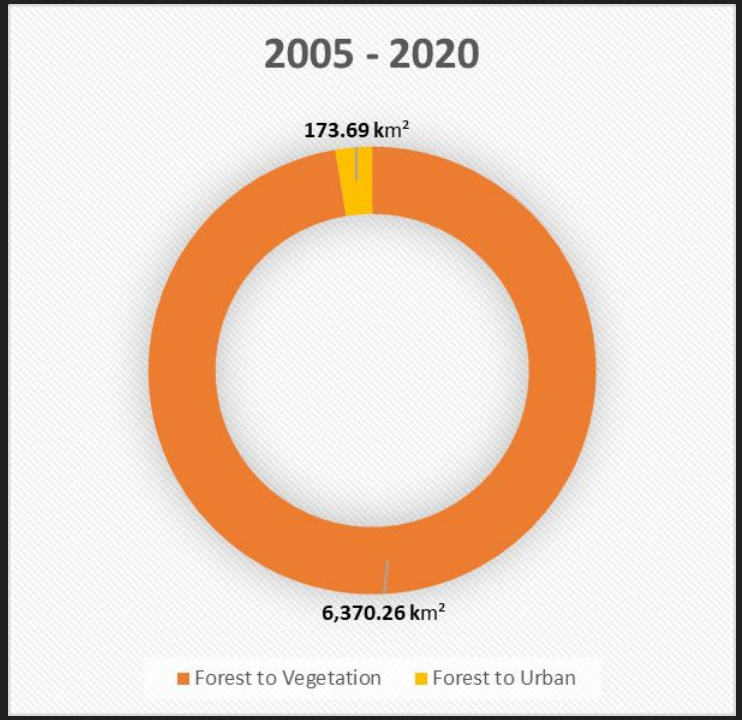

Pixel Based Supervised Classification Map Comparison of Landcover Types
2005
2020
Landcover Types
Supervised Classification
Forest
Agriculture
Developed
Water
Cloud
Spatial Reference
PCS: WGS 1984 UTM Zone 20N
GCS: GCS WGS 1984
Datum: WGS 1984
Projection: Transverse Mercator
Map Created By: Group 10
Map Creation Date: March 25, 2024
Data Source: Landsat 5 and 8
0 1.25 2.5 5 7.5 10
Kilometers
N
0 1.25 2.5 5 7.5 10
Kilometers
N

Key Results

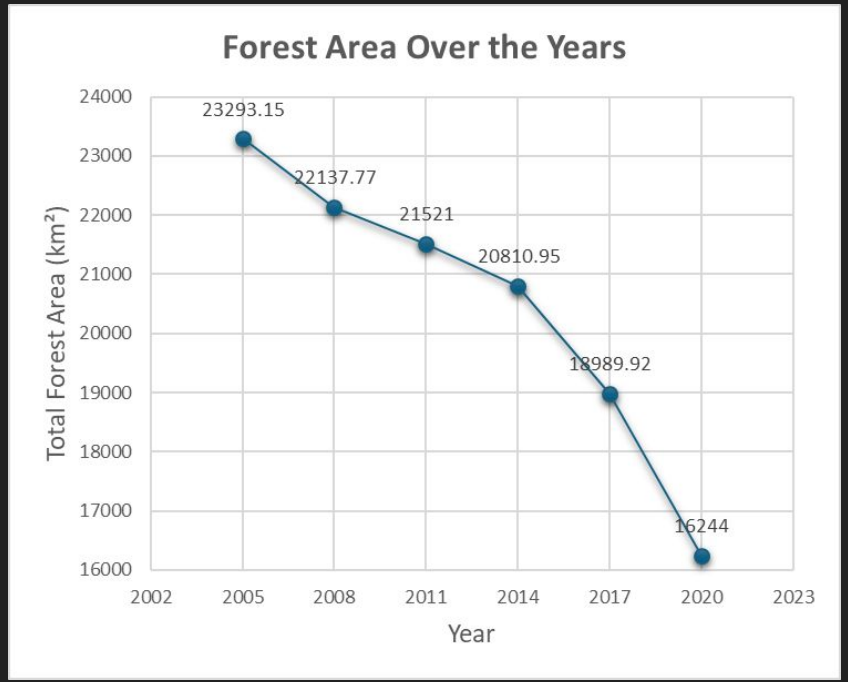

NDVI Comparison Map
2005
2020
NDVI Value
0.823101
-0.630305
Spatial Reference
Name: WGS 1984 UTM Zone 20N
PCS: WGS 1984 UTM Zone 20N
GCS: GCS WGS 1984
Datum: WGS 1984
Projection: Transverse Mercator
Author: Group 10
Kilometers
0 15 30 60 90 120
N
Kilometers
0 15 30 60 90 120
N

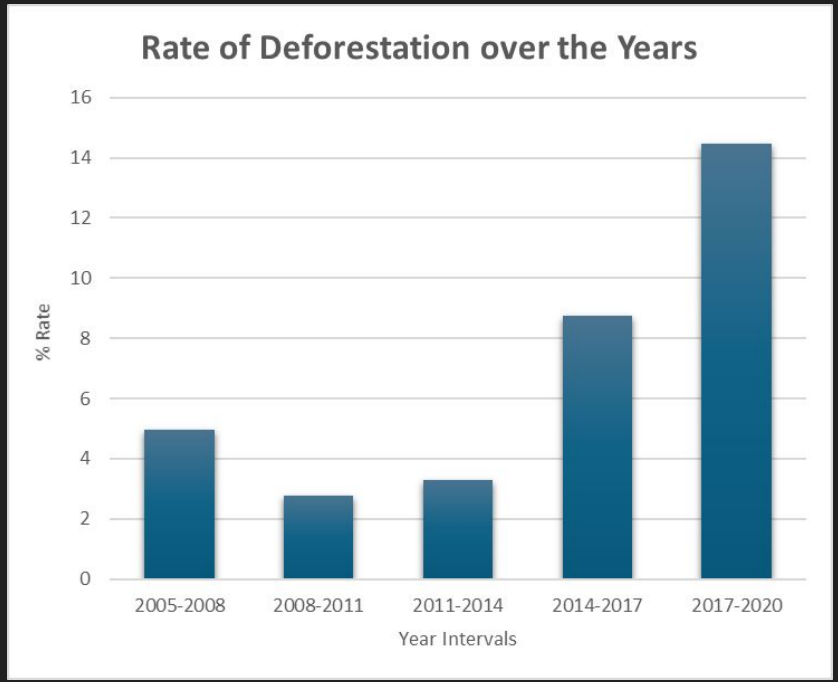
Forest Gain vs Forest Loss





% Rate of Deforestation





Key Results

Main cause: Clear land for agriculture and infrastructure development

Rate of deforestation follows a steady increase

Impacts of Deforestation

- Increased Greenhouse Gas Emissions
- Disrupted Water Cycle
- Habitat Loss & Biodiversity Decline

Conclusion

To conclude, the results derived from our analysis aligned with our expectations based on prior research. The rate of deforestation has increased significantly and the overall forest area of the Rondonia region of the Amazon has decreased. It is imperative to be aware of these rapid changes to aid in identifying potential causes and lead to potential solutions to minimize the damage we have on our environment.

Q&A

References

Hansen, M.C., (2022). Rondônia, Brazil deforestation rates & statistics: GFW. Forest Monitoring, Land Use & Deforestation Trends.

Lapola, D et al. The drivers and impacts of Amazon forest degradation. Science 379, eabp8622 (2023). DOI: 10.1126/science.abp8622

Simmon, R. (2007, March 31). Deforestation in Rondonia, Brazil. NASA. https://earthobservatory.nasa.gov/images/7548/deforestation-in-rondonia-brazil

Voiland, A. (2019, December 20). Tracking amazon deforestation from above. NASA. https://earthobservatory.nasa.gov/images/145988/tracking-amazon-deforestation-from-above