Peruvian Amazon Ecological Conservation

Assessing Land Cover Changes in the Peruvian Amazon to Identify Exploitative Agriculture Using NASA EO and PerúSAT-1

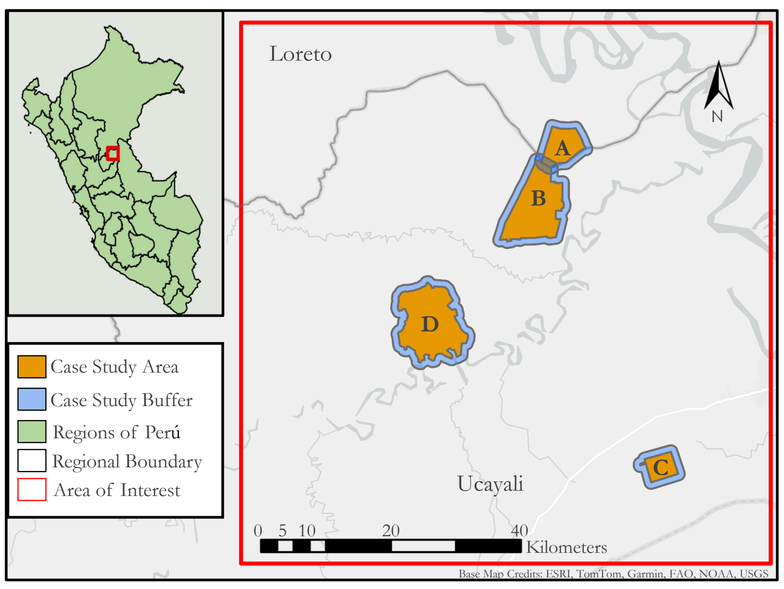
Project Synopsis

Perú aims to preserve Amazon forests that support biodiversity, global carbon storage, and ecosystem regulation. To monitor progress, forested sites are tracked for maintaining at least 30% tree cover. NASA DEVELOP partnered with Comisión Nacional de Investigaión y Desarrollo Aeroespacial (CONIDA) and Organismo de Evaluación y Fiscalización Ambiental (OEFA) to quantify deforestation due to palm oil expansion in Ucayali and Loreto between January 2017 and December 2023. Using Enhanced Vegetation Index (EVI) and Normalized Difference Vegetation Index (NDVI) changes as proxies for vegetative health, we found a decline. Using the Landsat series, our tropical Continuous Change Detection and Classification with Spectral Mixture Analysis (CCDC-SMA) estimated 2165.2 km² deforested from 2000 to 2023, with two case studies falling below 30% forest cover by 2023. We explored the feasibility of using PerúSAT-1 for continuous forest monitoring, and the CCDC-SMA results were validated with a supervised classification using high-resolution PerúSAT-1 imagery. Across CCDC-SMA and the supervised classification, trends and land cover change were consistent. The main limitation was the temporal resolution of PerúSAT-1 data.

Objectives

- **Quantify** deforestation using selected Landsat series in Perú
- **Classify** and **validate** the forest cover change detection using PerúSAT-1

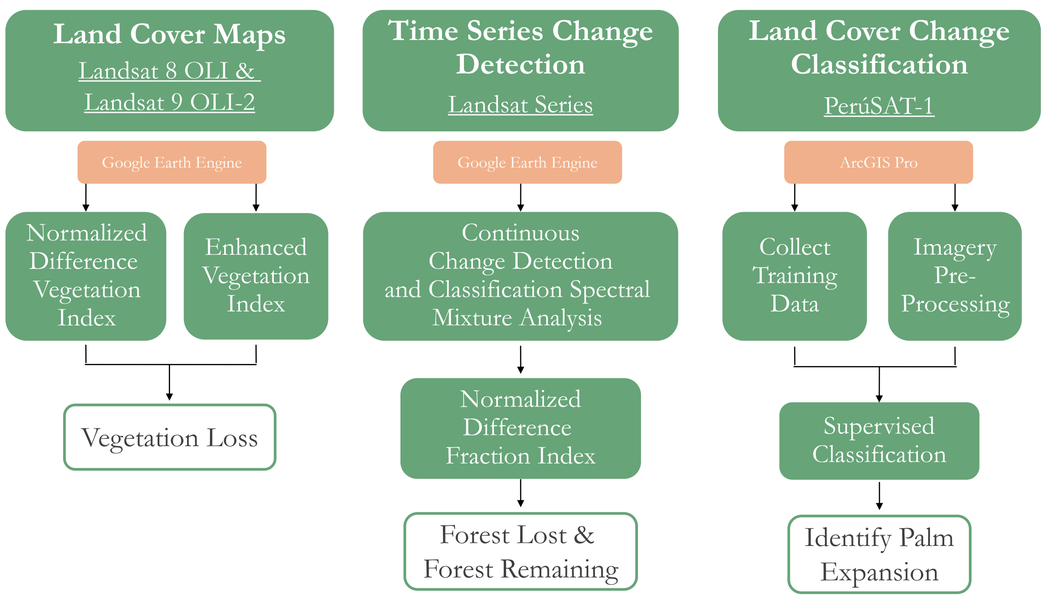
Study Area



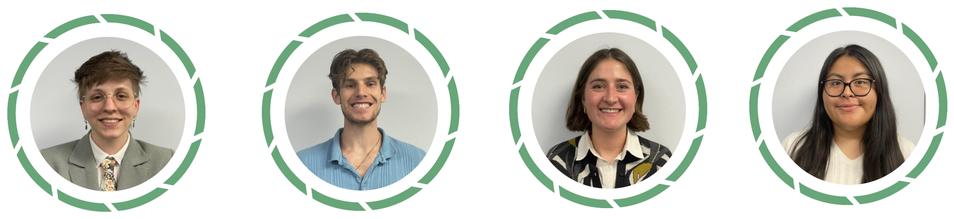
Project Partners

- Organismo de Evaluación y Fiscalización Ambiental
- Comisión Nacional de Investigación y Desarrollo Aeroespacial

Methodology



Team Members



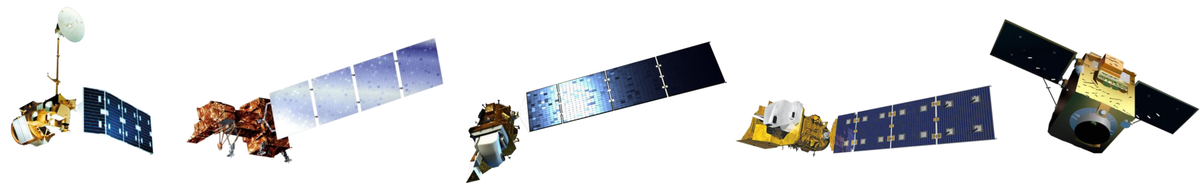
Beck De Fazio
Project Co-Lead

Brian Arruda
Project Co-Lead

Margaret Cox

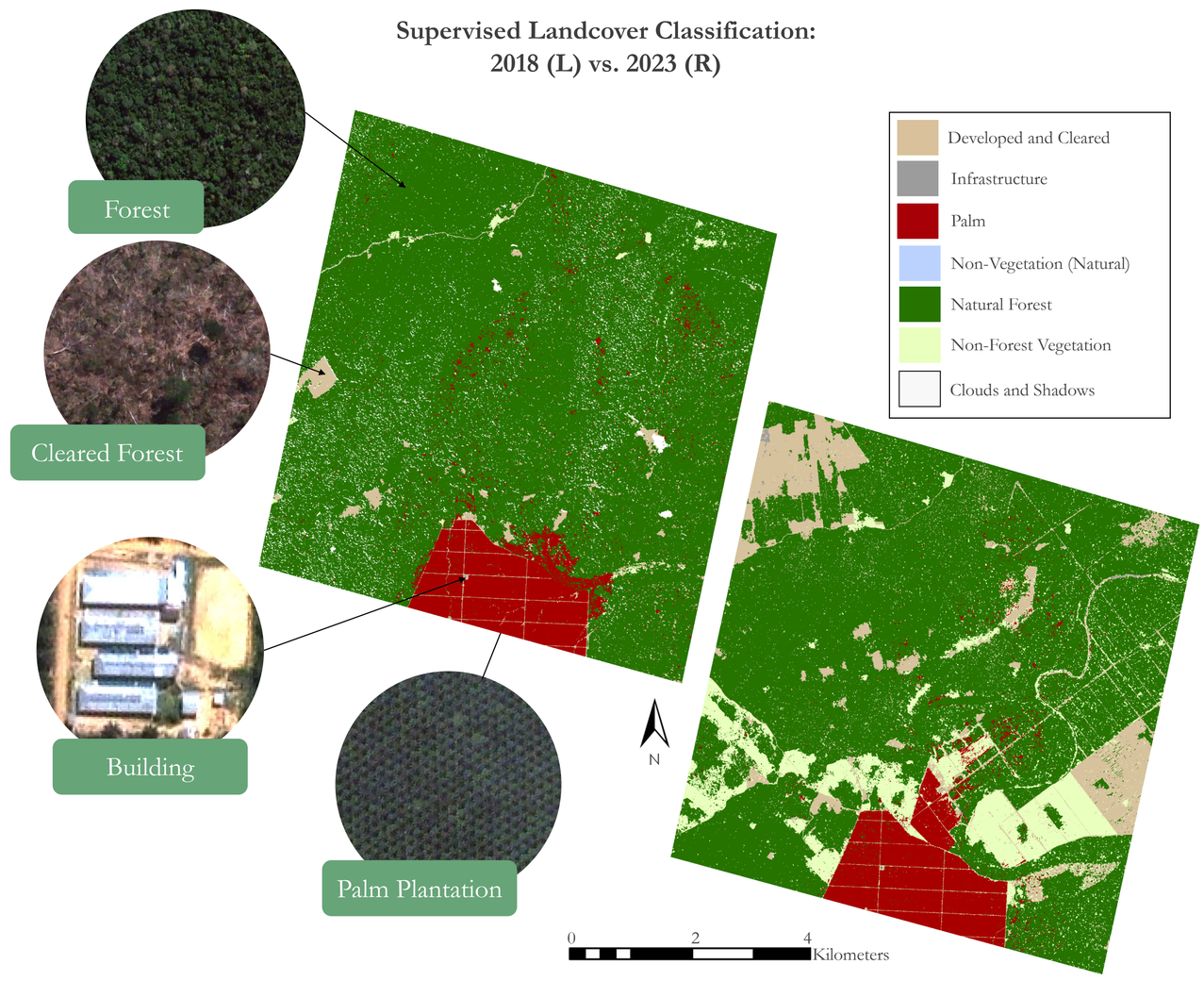
Ashley Laveriano

Earth Observations

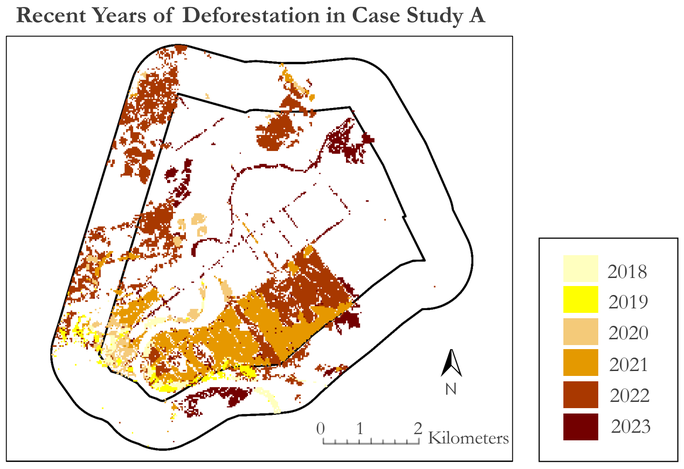


Landsat 4/5 TM | **Landsat 7** ETM+ | **Landsat 8** OLI | **Landsat 9** OLI-2 | **PerúSAT-1**

Results



Recent Years of Deforestation in Case Study A



Tree Cover Loss by Case Study

Case Study	% In-Tact Forest	Size (~km²)
A	82	51
B	12.8	73
C	68.2	16
D	25.7	88

Conclusions

- Total area deforested in the region from 2000-2023 was 2165.2 km².
- Case Studies A & B are less than 30% forest as of 2023.
- Supervised classification using PerúSAT-1 showed a 15.30% decline in forest cover from 2018 to 2023 in the observed images.
- This study found that the use of PerúSAT-1 in classifying land cover and assessing change over time is feasible, however could be enhanced given an increased temporal resolution and improved geolocation.

Acknowledgements

Advisors: Vanesa Martín, Stephanie Jimenéz, Natalia A. Bermudez, Jacob Abramowitz, Dr. Jeffrey Luvall, Dr. Robert Griffin
DEVELOP Center Lead: Cristina Villalobos-Heredia
Special Thanks: Christine Evans, Dr. Emil Cherrington
Contains modified PerúSat-1 data (2018-2023) provided by Perú's National Commission for Aerospace Research and Development