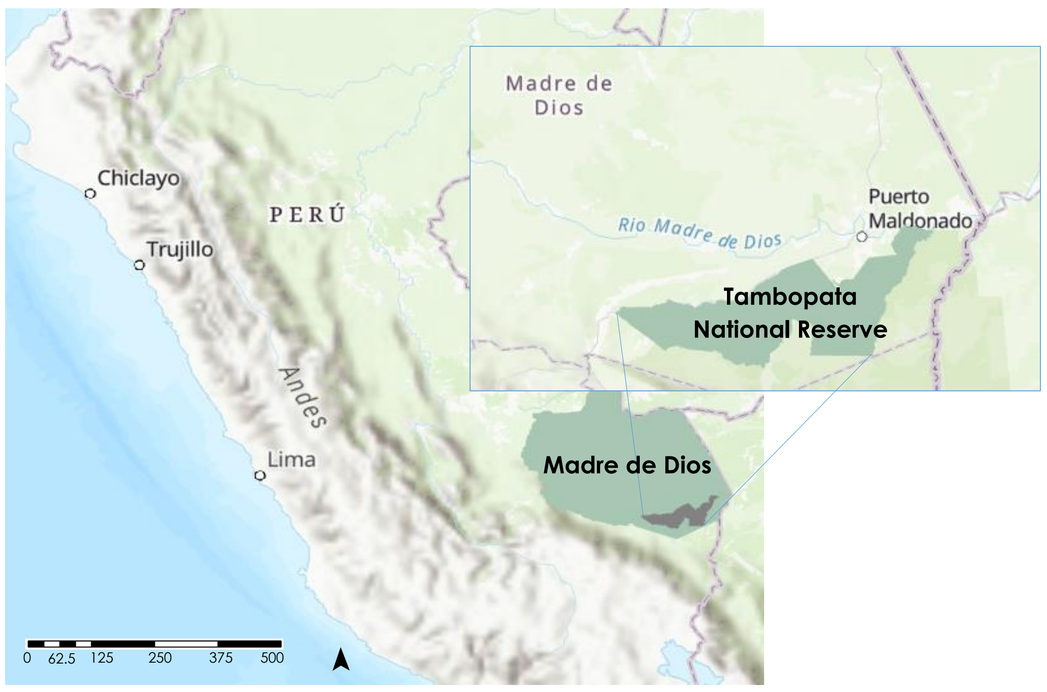
Assessing Methods for Gold Mining-Related Deforestation Detection in Amazonia Using NASA Earth Observations

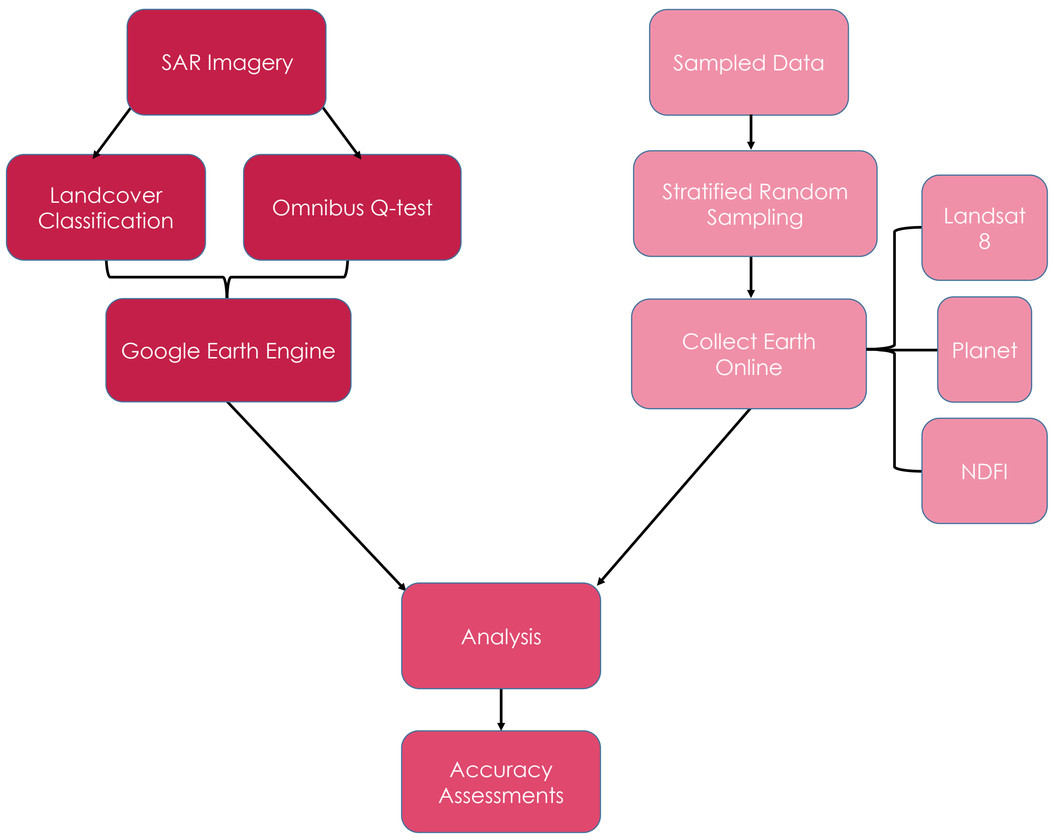
Abstract

Artisanal and small-scale gold mining (ASGM) is responsible for a large fraction of deforestation and disturbance in Amazonia. These activities cause severe impacts on the rainforest ecosystem and socioeconomic state of the region. NASA DEVELOP partnered with the Asociación para la Conservación de la Cuenca Amazónica (ACCA), NASA SERVIR Science Coordination Office, and the Spatial Informatics Group to enhance ASGM-related deforestation detection methods. ACCA currently uses the Omnibus Q-test Change Point Detection Algorithm to identify changes in Synthetic Aperture Radar (SAR) monthly-aggregated temporal data through the Sentinel-1 C-SAR satellite. The team determined the algorithm's accuracy by comparing a stratified random sample of change points against data from January 2019 to June 2020 identified using PlanetScope and Landsat 8 Operational Land Imager (OLI) Earth observations through Collect Earth Online. Our results indicated a users' accuracy of 55 percent for temporal change detection and producer's and user's accuracies of 99 and 97 percent for detecting when change did not occur. Of the labeled change points, only 19 percent were due to mining activity. This research can help our partners gain a more accurate understanding of where illegal gold mining may be taking place and inform decisions to remediate this activity.

Study Area



Methodology



Team Members

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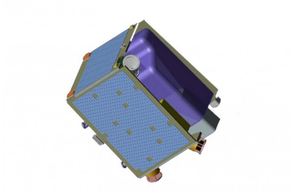
Objectives

- **Create** a stratified random sample of points from the image generated from the Q-test algorithm.
- **Identify** the temporal change points.
- **Generate** the user's and producer's accuracy of the Omnibus Q-test algorithm
- **Create** a StoryMap to provide partners with an educational and outreach tool

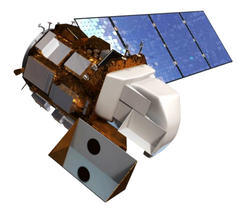
Earth Observations

Sentinel-1
Image credit: ESA

RapidEye
Image credit: Planet



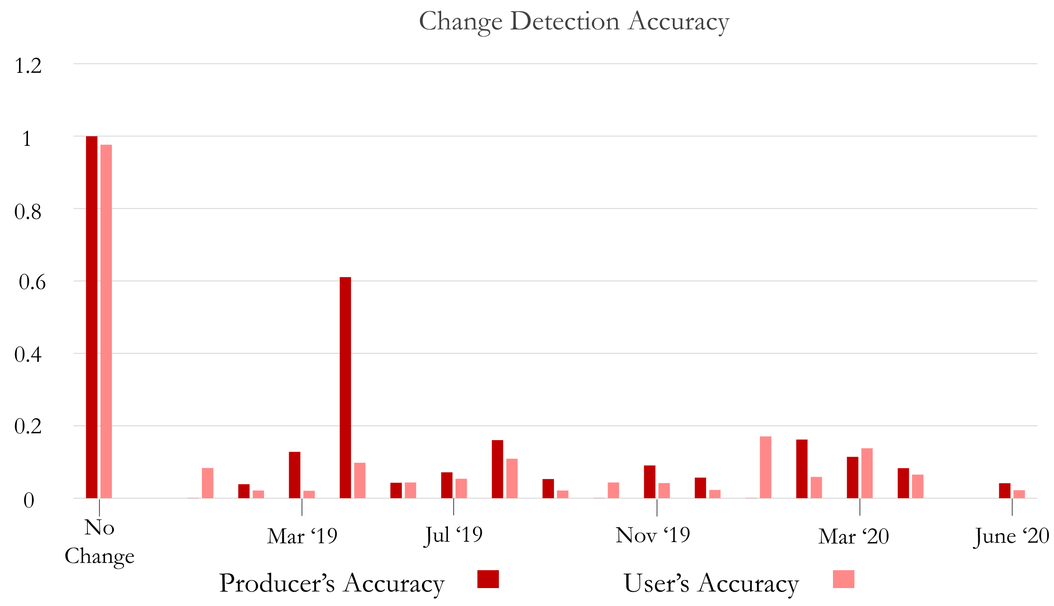
PlanetScope
Image credit: Planet



Landsat 8
Image credit: NASA

Results

The graph displays the user's and producer's accuracies between January 2019 and June of 2020. The first column lists the accuracy of the Omnibus Q-test detecting where there was no change. The following columns display accuracy of the algorithm detecting when change did occur.



Conclusions

- The classification accuracy rates were **99% producer's accuracy** and **97% user's accuracy** for no change classes.
- The algorithm has high sensitivity to small changes, like rivers swelling or drier months in the ecosystem.
- There was no filtering for single-pixel changes, speckling and poor imagery.

Project Partners

- NASA SERVIR Science Coordination Office
- Spatial Informatics Group (SIG)
- Asociación Para La Conservación De La Cuenca Amazónica (ACCA)

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Amazonia Disasters

Alabama – MSFC

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