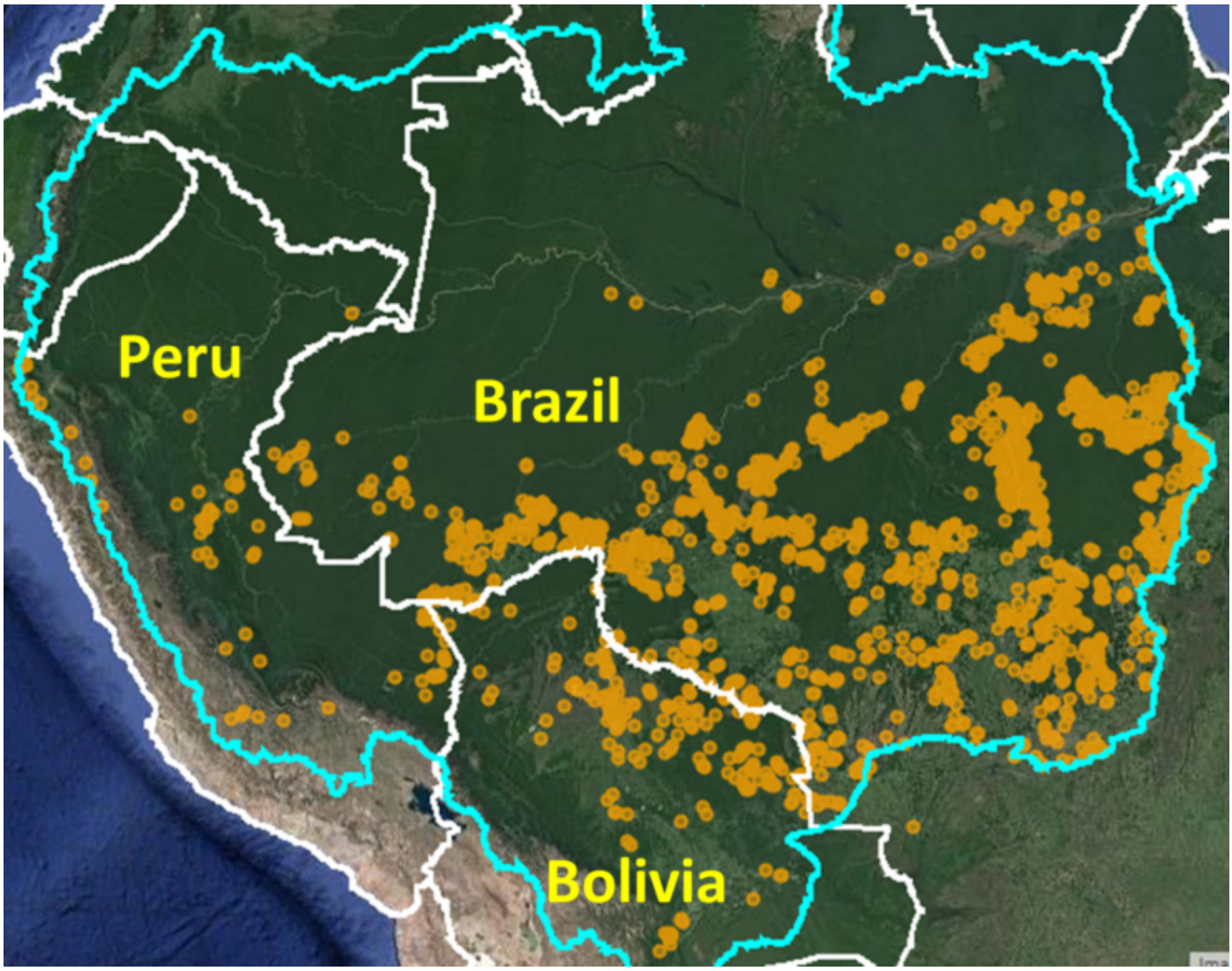
MAAP #129: Amazon Fires 2020 – Recap of Another Intense Fire Year



Base Map. Major Amazon fires 2020 (orange dots) within Amazon watershed (blue line). Data: MAAP.

Following the intense Amazon fire season of **2019** that made international headlines, here we report another major fire year in **2020**.

Using the novel data from our real-time Amazon Fires Monitoring app,* we documented over **2,500 major fires** across the Amazon in 2020 (see **Base Map**).

The vast majority (88%) of the major fires were in the **Brazilian Amazon**, followed by the **Bolivian Amazon** (8%) and **Peruvian Amazon** (4%). No major fires were detected in the other Amazonian countries.*

We highlight several major headlines:

- In the **Brazilian Amazon**, we detected **2,250 major fires**. Most (51%) burned recently deforested areas, defined as fires in areas previously cleared between 2018 and 2020. These fires burned an estimated 1.8 million acres, emphasizing the current high deforestation rates in Brazil. In September, there was a major spike in forest fires, impacting vast areas of standing forest (over 5 million acres).

- In the **Bolivian Amazon**, we detected **205 major fires**. The vast majority (88%) burned in Amazonian savanna and dry forest ecosystems. Notably, a quarter of these fires burned within protected areas.

- In the **Peruvian Amazon**, we detected **116 major fires**. There were three major types: 41% burned high elevation grasslands (impacting 26,000 acres), 39% burned recently deforested areas, and 17% burned standing forest (impacting 6,700 acres).

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- The vast majority of the major fires across all three countries were likely human-caused and **illegal**, in violation of governmental fire management regulations and moratoriums.

- The app was only fully implemented in 2020, so we do not have comparable data for **2019**. However, our extensive analysis of satellite imagery indicates that, in the Brazilian Amazon, both 2019 and 2020 had in common the extensive burning of recently deforested areas. The late season shift to forest fires seemed much more intense in 2020. In the Bolivian Amazon, both 2019 and 2020 had in common the extensive burning of Amazon savannas and dry forests.

See below for additional and more detailed findings for each country. Also, check out Mongabay's real-time Brazilian Amazon fire tracker based on our analysis.

Brazilian Amazon

Image 1. Major fire burning recently deforested area in Brazilian Amazon (Mato Grosso). Data: Planet.

We emphasize the following additional findings for the **Brazilian Amazon**:

- Of the 2,250 major fires, over half (**51%**) **burned recently deforested areas**, defined as areas where the forest was previously cleared between 2018 and 2020 prior to burning (**Image 1**). These fires burned an estimated **1.8 million acres** (742,000 hectares), highlighting the current high deforestation rates in Brazil.

- A striking number (**40%**) were **forest fires**, defined here as human-caused fires in standing forest. A rough initial estimate suggests that 5.4 million acres (2.2 million hectares) of Amazon forest burned.

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- Over half (51%) occurred in **September**, followed by August and October (25% and 15%, respectively). September was also when we documented a major shift from fires in recently deforested areas to forest fires.

- An important number of major fires (**12%**) occurred within **indigenous territories** and **protected areas**. The most impacted were Xingu and Kayapó Indigenous Territories, Jamanxim National Forest, and Nascentes da Serra do Cachimbo Biological Reserve.

- The vast majority of the major fires (**97%**) appear to be **illegal**, occurring after the Amazon fire moratoriums established in July (the government established a 4-month national fire moratorium starting July 15).

- Pará (38%) and Mato Grosso (31%) states had the most fires, followed by Amazonas (15%), Rondônia (11%), and Acre (4%).

Bolivian Amazon

Image 2. Major fire in Noel Kempff Mercado National Park, in the Bolivian Amazon. Data: Planet.

We emphasize the following additional findings for the **Bolivian Amazon**:

- Of the 2015 major fires, many (**46%**) occurred in Amazon **savannas**.

- Another **42%** of the fires were located in **forests**, mostly in the dry forests of the **Chiquitano**. Note, in November there was a major spike in these fires.

- Importantly, **25%** of the major fires were in **protected areas**. The most impacted were Noel Kempff Mercado National Park (**Image 2**), Copaibo Municipal Protected Area, Iténez National Park, Keneth Lee Reserve, Rios Blanco y Negro Wildlife Reserve, and Pampas del Río Yacuma Integrated Management Natural Area.

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- The vast majority of the fires (96%) were likely **illegal**, occuring after the fire moratoriums (August 3 in Beni and Santa Cruz, followed by October 5 nationally).
- Most of the fires occurred in the department of **Beni** (51%), followed by **Santa Cruz** (46%).
- August had the most fires (27%) followed closely by each of September, October, and November (24% each).

Peruvian Amazon

Image 3. Major fire in higher elevation grassland of the Peruvian Amazon. Data: Planet.

We emphasize the following additional findings for the **Peruvian Amazon**:

- Of the 116 major fires, many (39%) burned **recently deforested areas**. Although the pattern is similar to the Brazilian Amazon, the burned (and previously deforested) areas are much smaller (4,660 vs 1.8 million acres).
- There were also numerous major fires (41%) in **higher elevation grasslands** across several regions (**Image 3**). These fires impacted 26,000 acres (10,000 hectares). We likely underestimated the number of these fires because, due to the lack of biomass in these ecosystems, they didn't always register as a major fire in the app.
- Another 17% were **forest fires**, impacting 6,700 acres (2,700 hectares).

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- All of the fires in the Peruvian were likely **illegal**, according to Peruvian fire management regulations.
- **15 regions** experienced major fires, reflecting the mix of both grassland and forest fires. The regions with the most fires were Madre de Dios (23%), Ucayali (12%) and Junin (11%).
- November surprisingly had the most major fires (46%), followed by October and September (29% and 22%, respectively).

*Notes and Methodology

The **data** is based on our analysis of Amazon Conservation's novel real-time Amazon Fires Monitoring app. We started daily monitoring in May and continued through November. Specifically, he first major fire was detected on May 28 and the data was updated daily through November 30.

The app displays aerosol emissions as detected by the European Space Agency's Sentinel-5 satellite. Elevated aerosol levels indicate the burning of large amounts of biomass, defined here as a "major fire". In a novel approach, the app combines data from the atmosphere (aerosol emissions in smoke) and the ground (heat anomaly alerts) to effectively detect and visualize major Amazon fires.

When fires burn, they emit gases and aerosols. A new satellite (Sentinel-5P from the European Space Agency) detects these **aerosol emissions** (aerosol definition: Suspension of fine solid particles or liquid droplets in air or another gas). Thus, the major feature of the app is detecting elevated aerosol emissions which in turn indicate the burning of large amounts of biomass. For example, the app distinguishes small fires clearing old fields (and burning little biomass) from larger fires burning recently deforested areas or standing forest (and burning lots of biomass). The spatial resolution of the aerosol data is 7.5 sq km. The high values in the aerosol indices (AI) may also be due to other reasons such as emissions of volcanic ash or desert dust so it is important to cross reference elevated emissions with heat data and optical imagery.

We define "**major fire**" as one showing elevated aerosol emission levels on the app, thus indicating the burning of elevated levels of biomass. This typically translates to an aerosol index of >1 (or cyan-green to red on the app). To identify the exact source of the elevated emissions, we reduce the intensity of aerosol data in order to see the underlying terrestrial heat-based fire alerts. Typically for major fires, there is a large cluster of alerts. The major fires are then confirmed, and burn areas estimated, using high-resolution satellite imagery from Planet Explorer.

Some additional country-specific notes:

Bolivia - As note above, the high values in the aerosol indices (AI) may also be due to other reasons such as emissions of volcanic ash or desert dust. Hence, some areas, such as the Salar de Uyuni, in western Bolivia, often have orange or red tones.

Colombia - Our daily 2020 monitoring took place from May until November, but Colombia's drier burning season was likely earlier in the year (January - March). We will be monitoring Colombia during this time frame in 2021.

Acknowledgements

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Citation

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