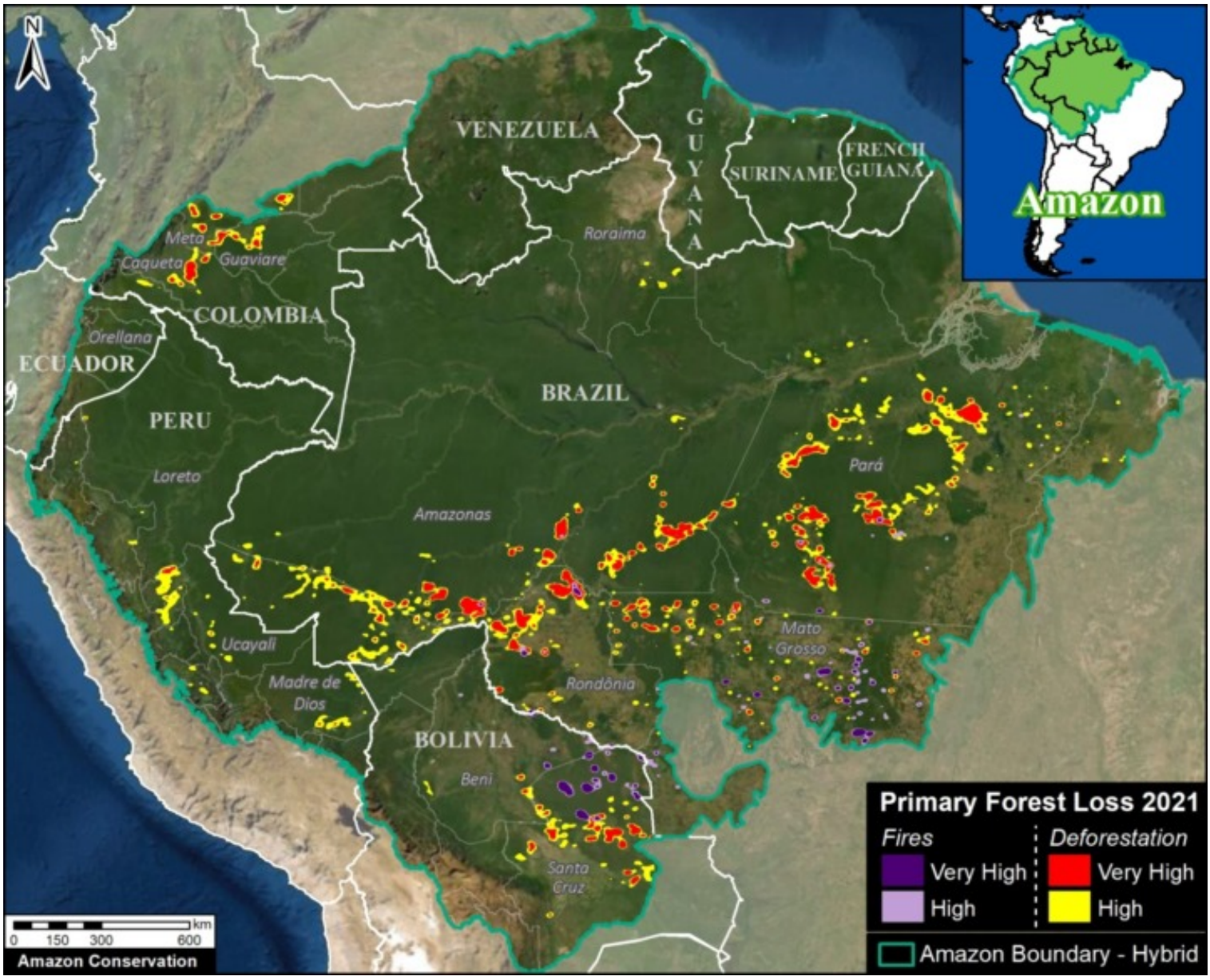
MAAP #158: Amazon Deforestation & Fire Hotspots 2021



2021 Amazon Forest Loss Base Map. Deforestation and fire hotspots across the full Amazon biome. Data: UMD/GLAD, ACA/MAAP.

We present a detailed look at the major **2021 Amazon forest loss hotspots**, based on the final annual data produced by the University of Maryland.

This dataset is unique in that distinguishes forest loss from fire, leaving the rest as a close proxy for deforestation.

Thus, for the first time, the results include both **deforestation and fire hotspots** across the Amazon.

The Base Map (see right) and Results Graph (see below) reveal several **key findings**:

- In **2021**, we estimate the loss of **2 million hectares** (4.9 million acres) of primary forest loss across the nine countries of the Amazon biome. This total represents a slight decrease from 2020, but the 6th highest on record.
- The vast majority of this loss was **deforestation** (78%), accounting for 1.57 million hectares. This total represents a slight increase from 2020, and the 5th highest on record. This deforestation impacted the entire stretch of the southern Amazon (southern Brazil, Bolivia, and Peru) plus further north in Colombia.
- This deforestation was concentrated in **Brazil (73%)**, **Bolivia (10%)**, **Peru (8%)**, and **Colombia (6%)**. In Brazil and Bolivia, deforestation was the highest since 2017. In Peru and Colombia, deforestation dropped from 2020 but was still

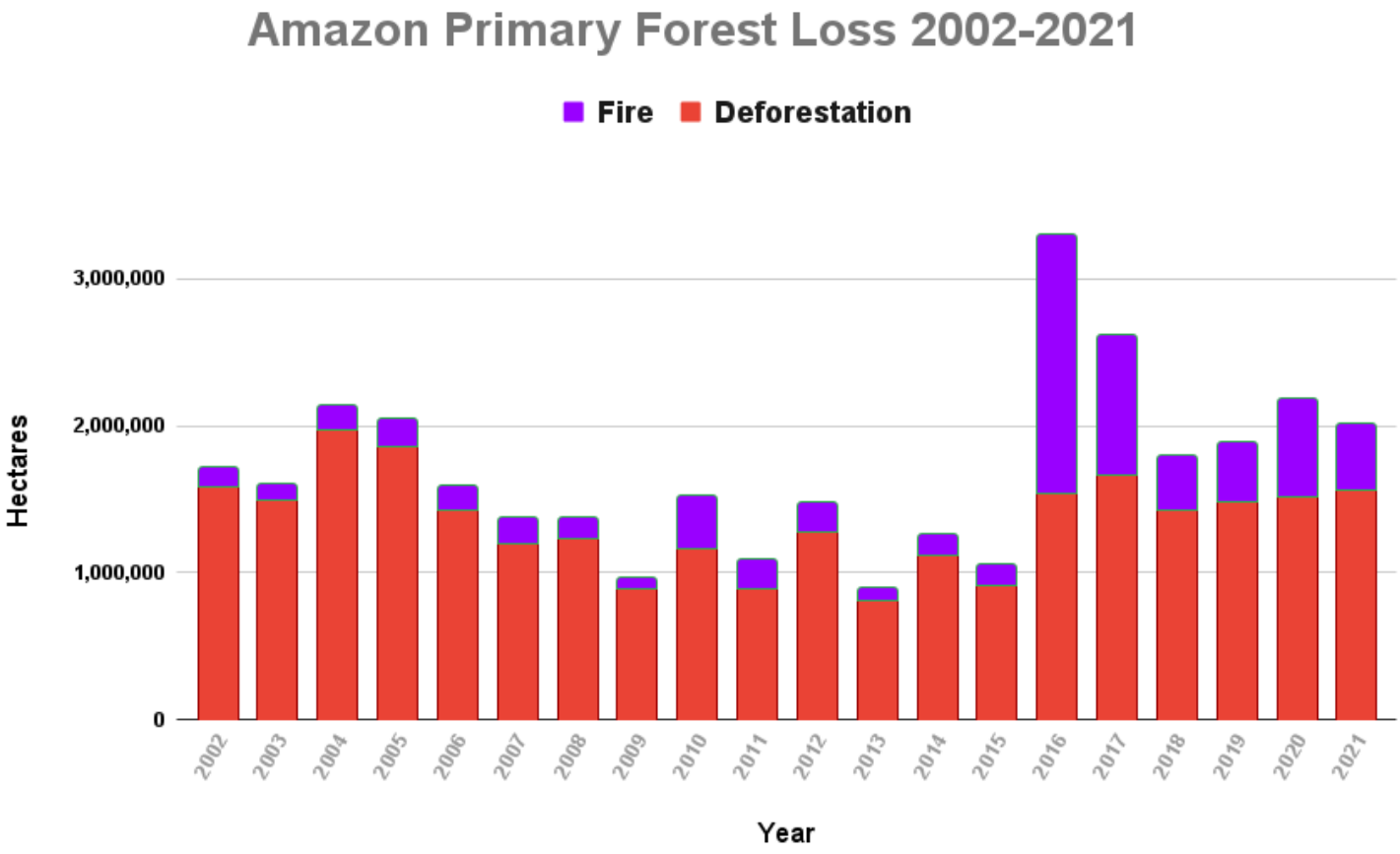
2016. This PDF was generated from MAAPROJECT.org MAAP is developed by Amazon Conservation Association (ACA) and Conservación Amazónica (ACCA) All use is Open-Access, but must contain an attribution link back to maaproject.org or the citation at the end of the article.

historically high. See below for maps and graphs for each country. See Annex for 2020-21 details.

- **Fires** directly caused the remaining primary forest loss (22%), accounting for 436,000 hectares. This total represents a decrease from the severe fire season of 2020, but was the 4th highest on record. Moreover, each of the six most intense fire seasons has occurred in the past six years. Over 90% of the fire impact occurred in just two countries: Brazil and Bolivia. Note that fire impacts were concentrated in the southeast of each country (Mato Grosso and Santa Cruz states, respectively).

- **Since 2002**, we estimate the deforestation of over **27 million hectares** (67 million acres) of primary forest, greater than the size of the United Kingdom or the U.S. state of Colorado. On top of this, we estimate an additional impact of 6.7 million hectares due to fires.

Below, we zoom in on the four countries with the highest deforestation (Brazil, Bolivia, Peru, and Colombia), with additional maps and analysis.



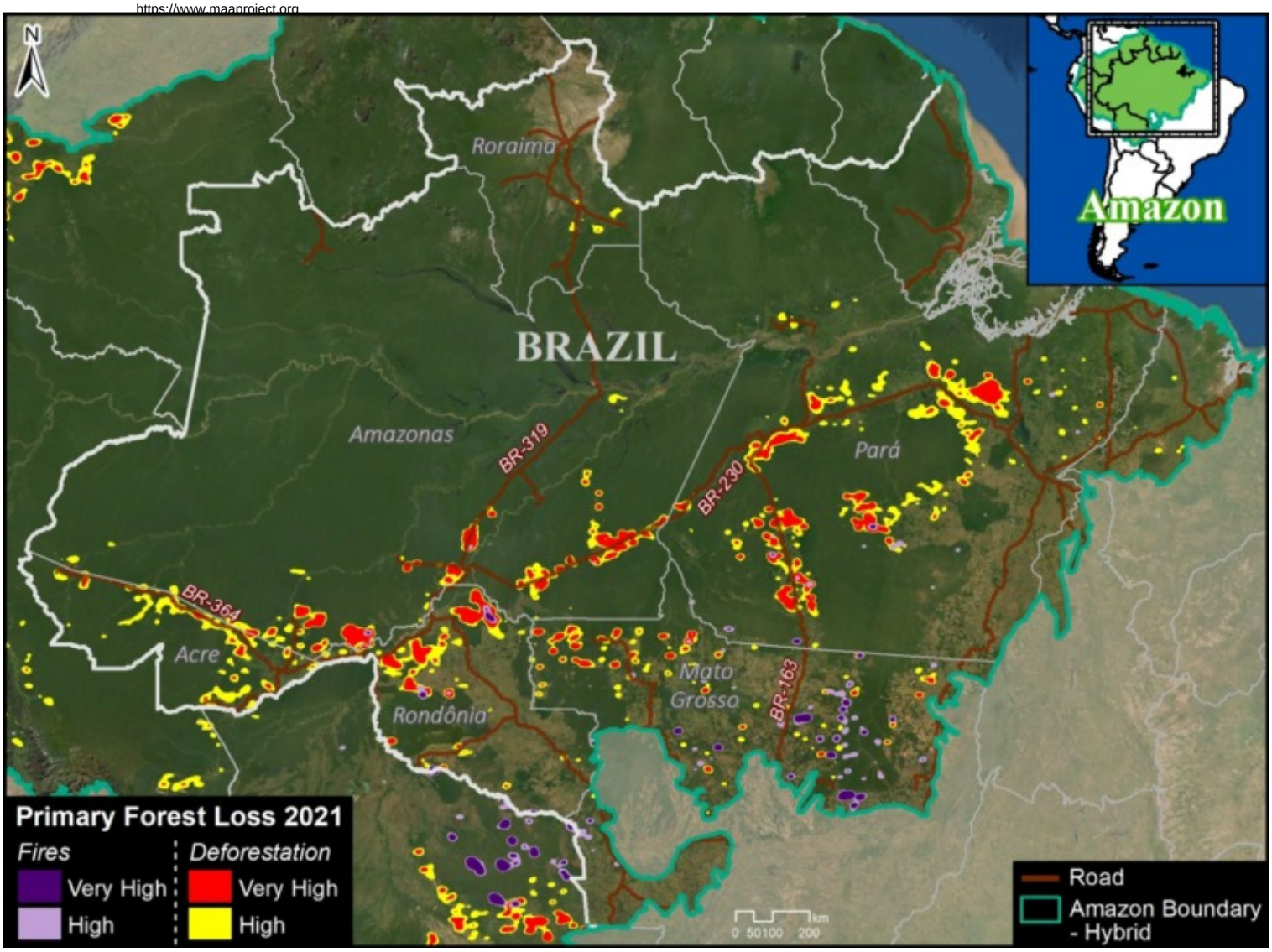
Amazon Forest Loss Results Graph, 2002-21. Data: UMD/GLAD, ACA/MAAP.

For **deforestation**, note that in 2021 there was a slight increase across the Amazon, continuing a gradual four-year trend. 2021 had the 5th highest deforestation on record (behind just 2002, 2004, 2005, and 2017).

For **fire**, in 2021 there was a decrease from the severe fire season of 2020, but was the 4th highest on record (behind just 2016, 2017, and 2020). Moreover, each of the last six years is in the top six worst fire seasons across the Amazon.

For total forest loss (deforestation and fire combined), in 2021 there was slight decrease from 2020, but the 6th highest on record.

2016. This PDF was generated from MAAPROJECT.org MAAP is developed by Amazon Conservation Association (ACA) and Conservación Amazónica (ACCA) All use is Open-Access, but must contain an attribution link back to maaproject.org or the citation at the end of the article.



Brazil Base Map, 2021. Deforestation and fire hotspots in the Brazilian Amazon. Data: UMD/GLAD, ACA/MAAP.

Brazilian Amazon

In 2021, the Brazilian Amazon lost **1.1 million hectares** of primary forest to deforestation. Fires directly impacted an additional 293,000 hectares.

The deforestation was the highest since 2017 and also the peak of the early 2000s (6th highest on record). The fire impact was relatively high (5th highest on record), but less than the peak years of 2016, 2017, and 2020.

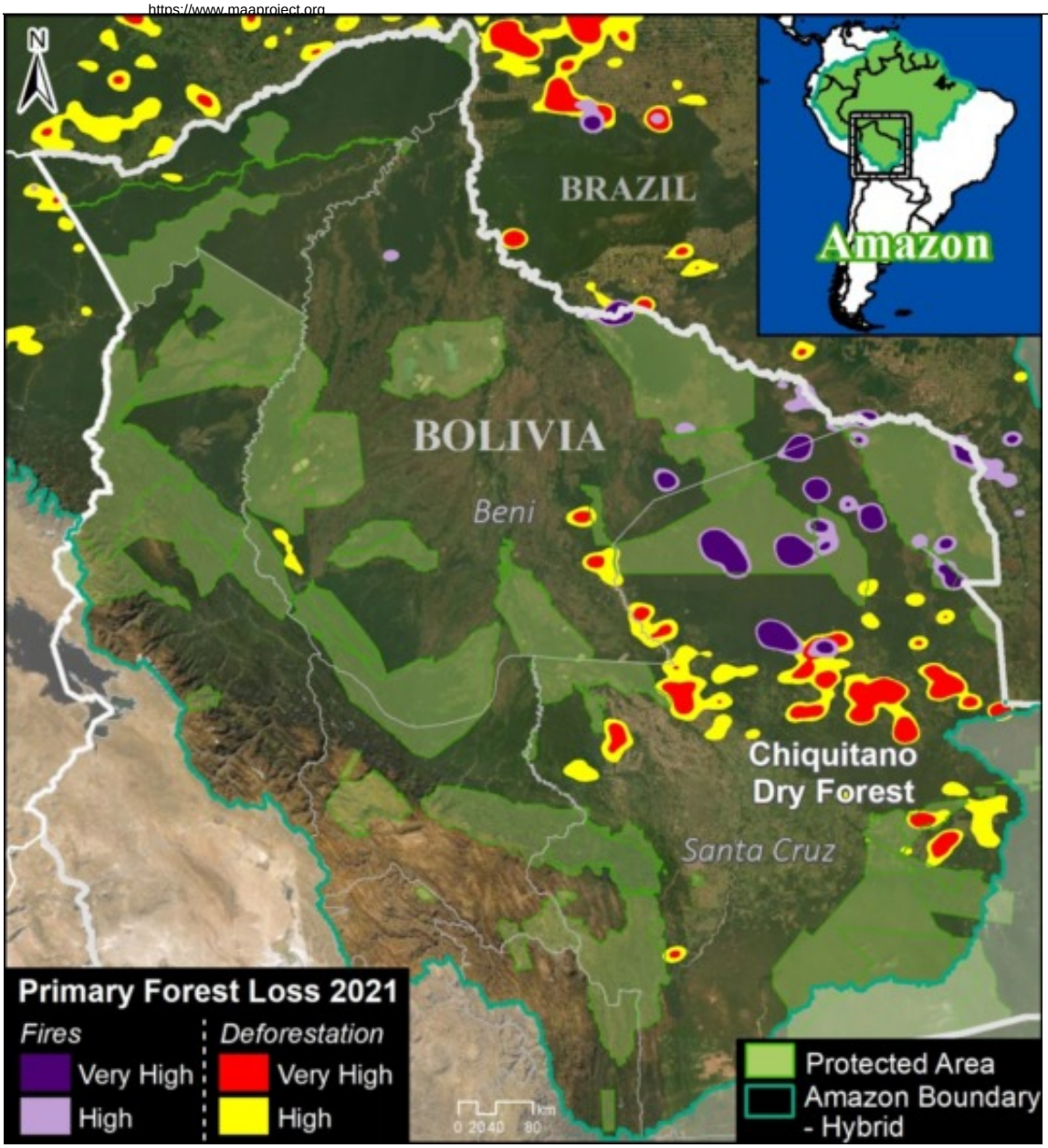
The deforestation was concentrated along the major **road networks**, especially roads 163, 230, 319, and 364 in the states of Acre, Amazonas, Pará, and Rondônia (see Brazil Base Map).

The direct fire impacts were concentrated in the southeastern state of Mato Grosso.

It is also important to note that many areas experienced the **one-two combination** of initial deforestation followed by fire to prepare the area for agriculture or cattle.

2016. This PDF was generated from MAAPROJECT.org MAAP is developed by Amazon Conservation Association (ACA) and Conservación Amazónica (ACCA) All use is Open-Access, but must contain an attribution link back to maaproject.org or the citation at the end of the article.

2016. This PDF was generated from MAAPROJECT.org MAAP is developed by Amazon Conservation Association (ACA) and Conservación Amazónica (ACCA) All use is Open-Access, but must contain an attribution link back to maaproject.org or the citation at the end of the article.



Bolivia Base Map. Deforestation hotspots in Bolivian Amazon. Data: UMD/GLAD, ACA/MAAP.

Bolivian Amazon

In 2021, the Bolivian Amazon lost **161,000 hectares** of primary forest to deforestation. Fires directly impacted an additional 106,000 hectares.

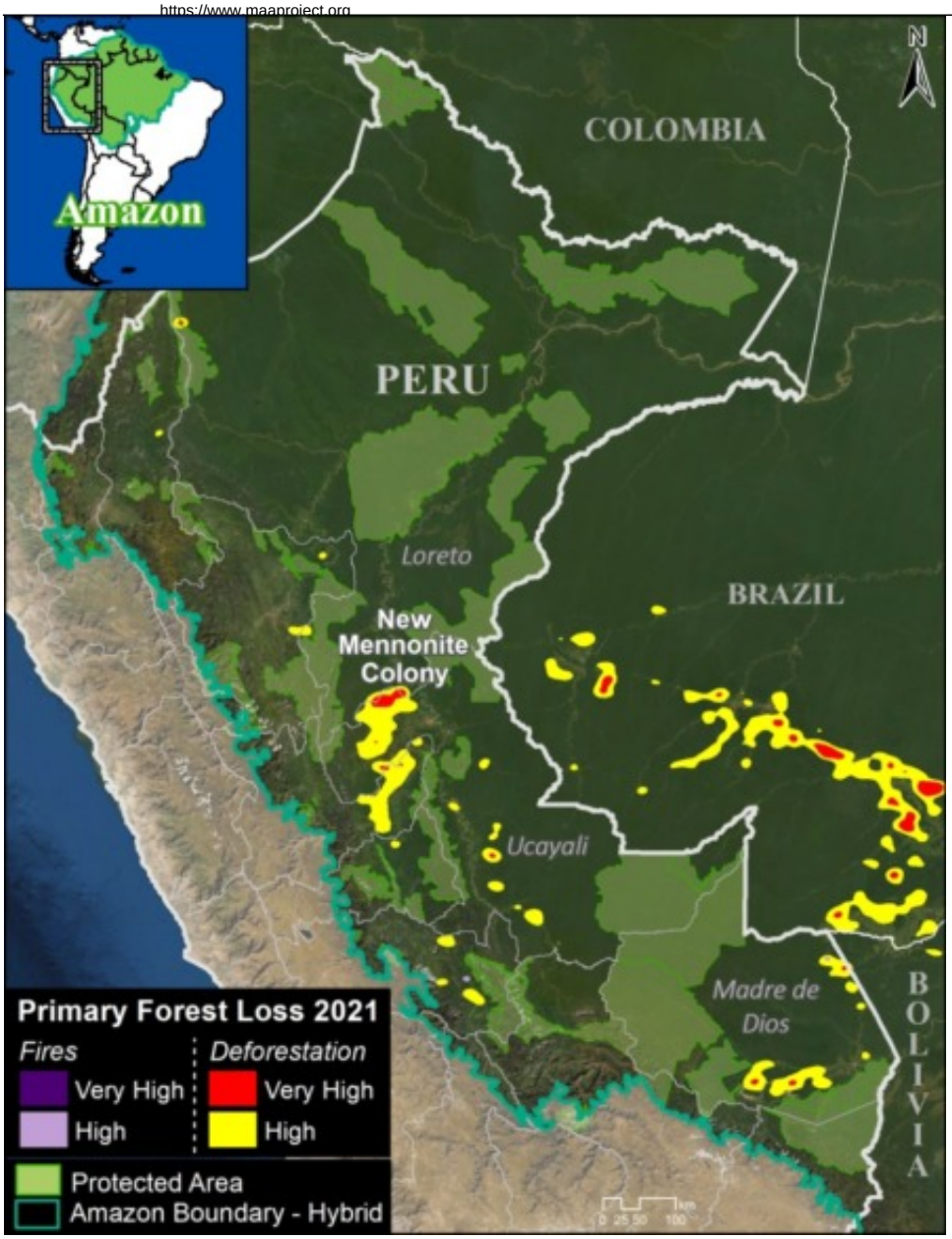
Deforestation was the third-highest on record, just behind the peak in 2016 and 2017. The fire impact was the second-highest on record, behind just the intense year of 2020 (thus, the last two years are the two highest on record).

Both the deforestation and fires were concentrated in the southeastern department of Santa Cruz (see Bolivia Base Map).

Much of the deforestation was associated with large-scale agriculture, while the fires once again impacted important natural ecosystems, most notably the Chiquitano dry forests.

2016. This PDF was generated from MAAPROJECT.org MAAP is developed by Amazon Conservation Association (ACA) and Conservación Amazónica (ACCA) All use is Open-Access, but must contain an attribution link back to maaproject.org or the citation at the end of the article.

2016. This PDF was generated from MAAPROJECT.org MAAP is developed by Amazon Conservation Association (ACA) and Conservación Amazónica (ACCA) All use is Open-Access, but must contain an attribution link back to maaproject.org or the citation at the end of the article.



Peru Base Map. Deforestation hotspots in the Peruvian Amazon. Data: UMD/GLAD, ACA/MAAP.

Peruvian Amazon

In 2021, the Peruvian Amazon lost **132,400 hectares** of primary forest to deforestation. Fires directly impacted an additional 21,800 hectares.

Deforestation dropped from a record high in 2020, but was 6th highest on record. Thre fire impact was the second-highest on record (behind just 2017).

The deforestation was concentrated in the central and southern Amazon (Ucayali and Madre de Dios regions, respectively) (see Peru Base Map).

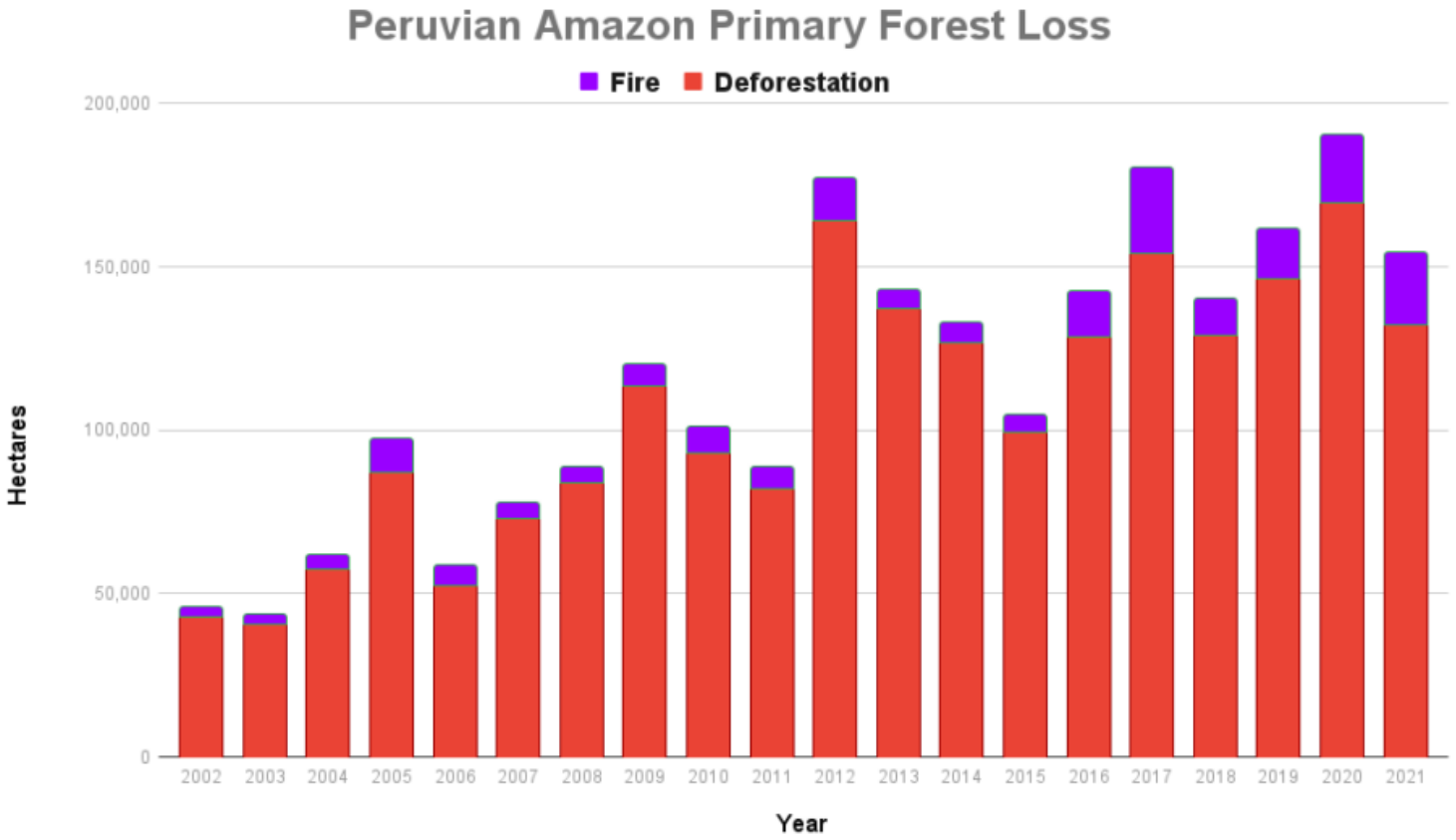
We highlight the rapid deforestation (365 hectares) for a **new Mennonite colony** in 2021, near the town of Padre Marquez (see MAAP #149).

Also, note some additional hotspots in the south (Madre de Dios region), but these are largely from expanding agriculture instead of the historical driver of gold mining.

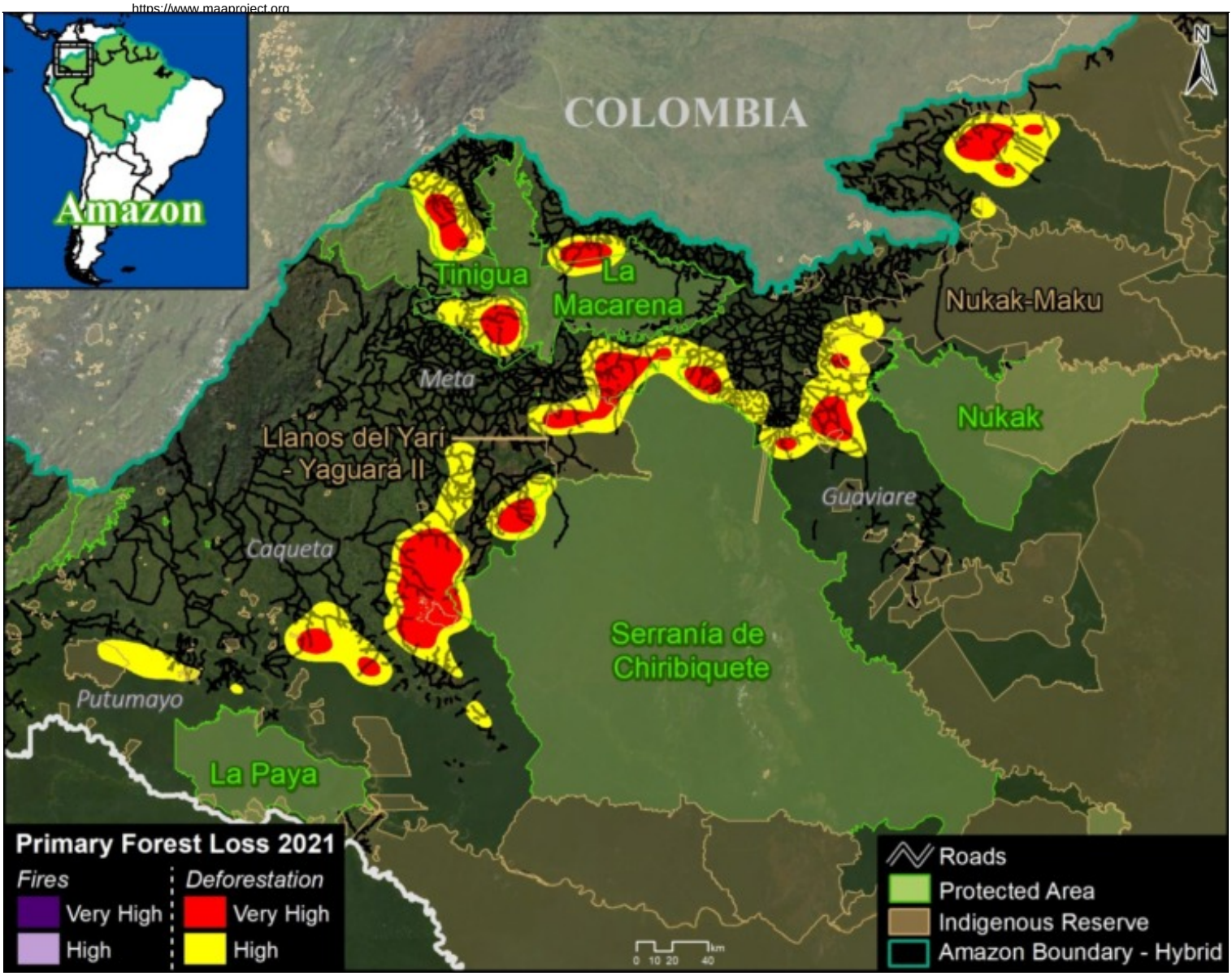
Indeed, gold mining deforestation has been greatly reduced due to government actions, but this illegal activity still threatens several key areas and indigenous territories (MAAP #154).

2016. This PDF was generated from MAAPROJECT.org MAAP is developed by Amazon Conservation Association (ACA) and Conservación Amazónica (ACCA) All use is Open-Access, but must contain an attribution link back to maaproject.org or the citation at the end of the article.

Rapid deforestation (365 hectares) for a new Mennonite colony in 2021, near the town of Padre Marquez. Data: Planet.



2016. This PDF was generated from MAAPROJECT.org MAAP is developed by Amazon Conservation Association (ACA) and Conservación Amazónica (ACCA) All use is Open-Access, but must contain an attribution link back to maaproject.org or the citation at the end of the article.



Colombia Base Map. Deforestation hotspots in northwest Colombian Amazon. Data: UMD/GLAD, ACA/MAAP, FCDS.

Colombian Amazon

In 2021, the Colombian Amazon lost **98,000 hectares** of primary forest to deforestation. Fires directly impacted an additional 9,000 hectares.

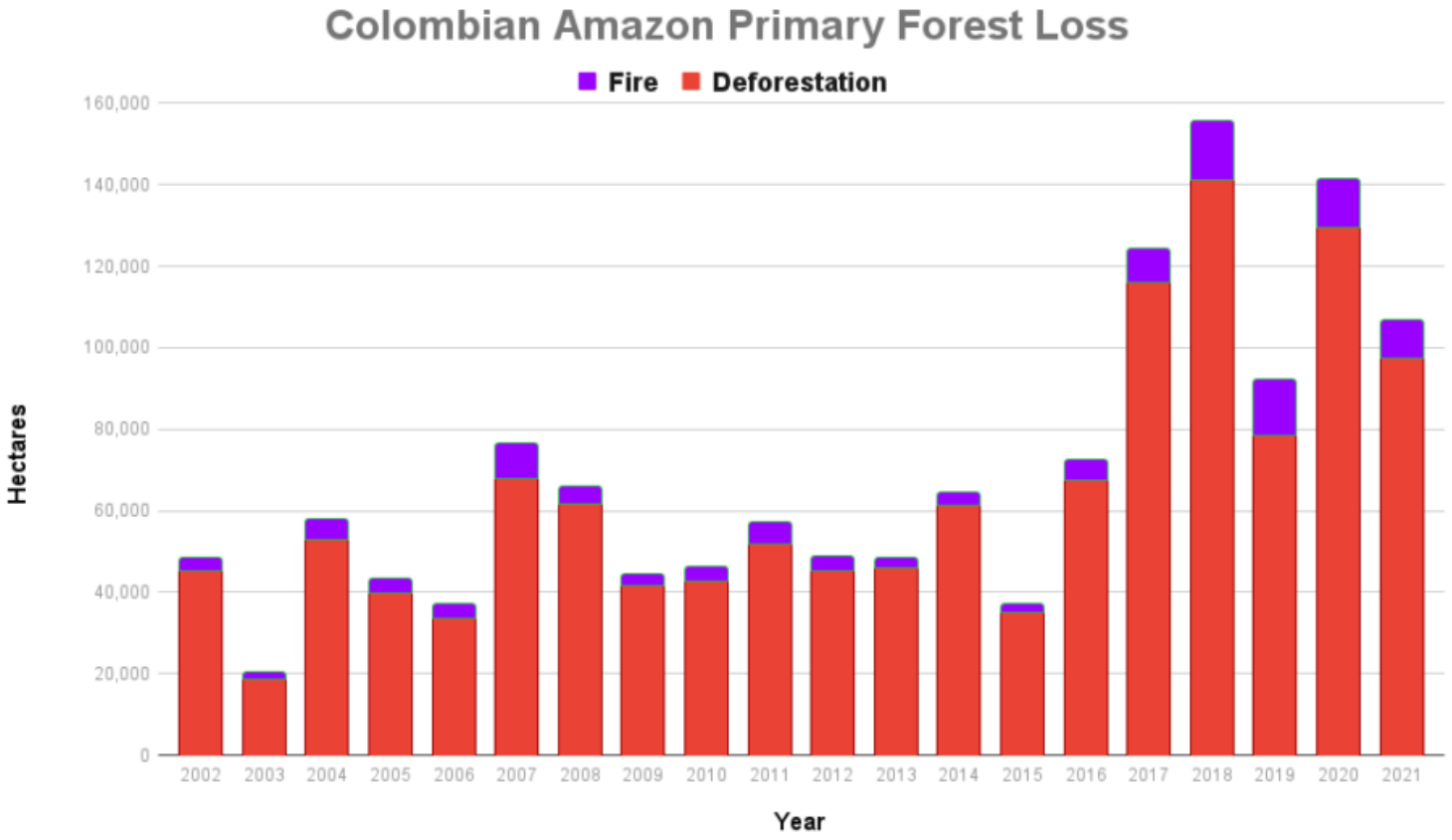
Deforestation and fire dropped from last year, but both were the fourth highest on record, following the trend of elevated forest loss and associated fires since the peace agreement in 2016.

As described in previous reports (see MAAP #120), the Colombia Base Map shows there continues to be an **“arc of deforestation”** in the northwest Colombian Amazon (Caqueta, Meta, and Guaviare departments).

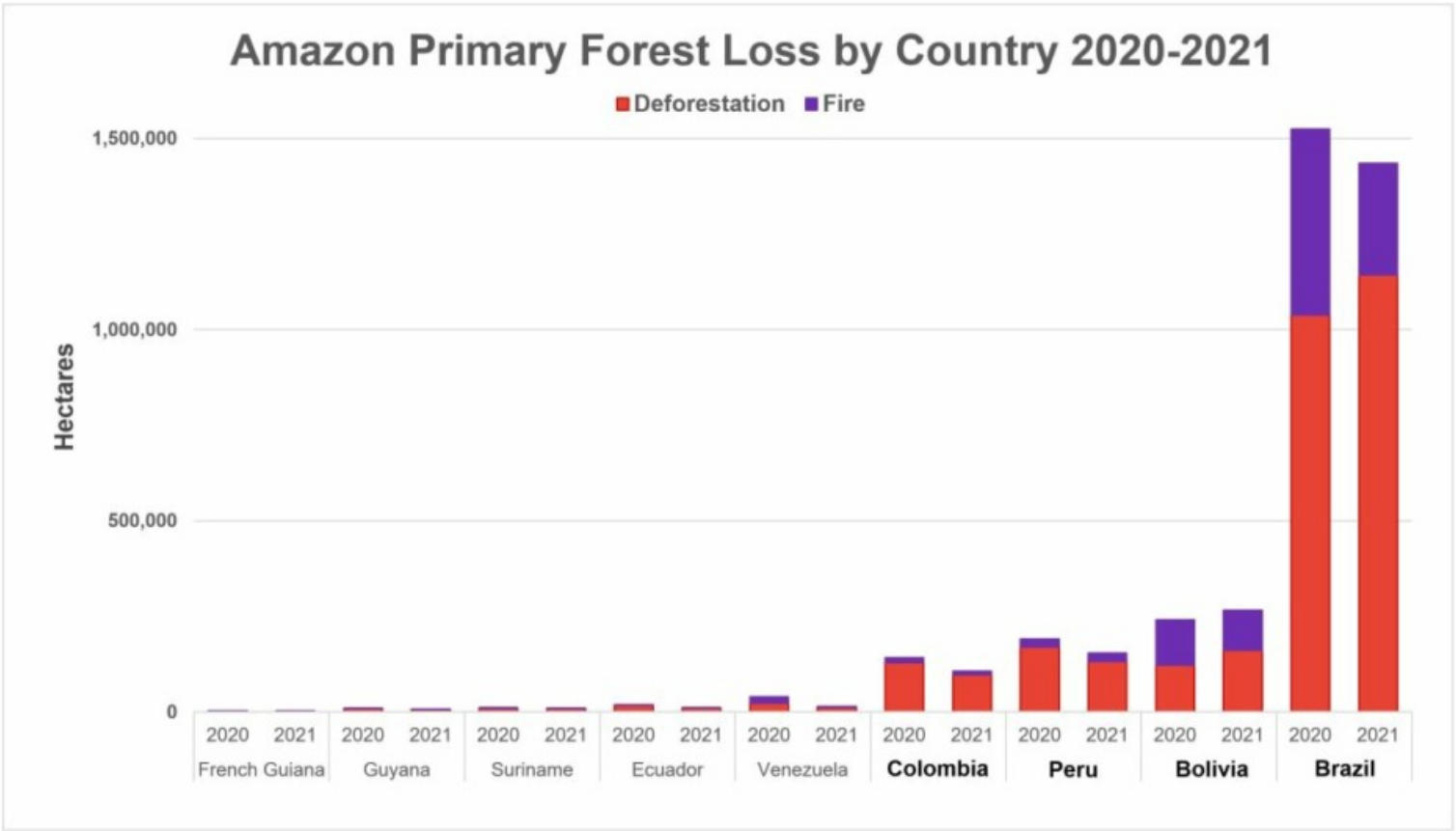
This arc impacts numerous Protected Areas (particularly Tinigua and Chiribiquete National Parks) and Indigenous Reserves (particularly Yari-Yaguara II and Nukak Maku).

The main drivers of deforestation in the Colombian Amazon are land grabbing, expansion of road networks, and cattle ranching.

2016. This PDF was generated from MAAPROJECT.org MAAP is developed by Amazon Conservation Association (ACA) and Conservación Amazónica (ACCA) All use is Open-Access, but must contain an attribution link back to maaproject.org or the citation at the end of the article.



Annex



2016. This PDF was generated from MAAPROJECT.org MAAP is developed by Amazon Conservation Association (ACA) and Conservación Amazónica (ACCA) All use is Open-Access, but must contain an attribution link back to maaproject.org or the citation at the end of the article.

Notes and Methodology

The analysis was based on 30-meter resolution annual forest loss data produced by the University of Maryland and also presented by Global Forest Watch. For the first time, this data set distinguished forest loss caused directly by fire (note that virtually all Amazon fires are human-caused). The remaining forest loss serves as a likely close proxy for deforestation, with the only remaining exception being natural events such as landslides, wind storms, and meandering rivers.

Importantly, we applied a filter to calculate only primary forest loss by intersecting the forest cover loss data with the additional dataset “primary humid tropical forests” as of 2001 (Turubanova et al 2018). For more details on this part of the methodology, see the Technical Blog from Global Forest Watch (Goldman and Weisse 2019).

Our geographic range for the Amazon is a hybrid designed for maximum inclusion: biogeographic boundary (as defined by RAISG) for all countries, except for Bolivia where we use the watershed boundary.

To identify the deforestation hotspots, we conducted a kernel density estimate. This type of analysis calculates the magnitude per unit area of a particular phenomenon, in this case, forest cover loss. We conducted this analysis using the Kernel Density tool from the Spatial Analyst Tool Box of ArcGIS. We used the following parameters:

Search Radius: 15000 layer units (meters)
Kernel Density Function: Quartic kernel function
Cell Size in the map: 200 x 200 meters (4 hectares)
Everything else was left to the default setting.

For the Base Map, we used the following concentration percentages: Medium: >5%; High: >7%; Very High: >14%.

Acknowledgements

We thank A. Gómez (FCDS), R. Botero (FCDS)... for helpful comments on earlier drafts of the text and images.

This work was supported by NORAD (Norwegian Agency for Development Cooperation) and ICFC (International Conservation Fund of Canada).

Citation

Finer M, Mamani N (2022) Amazon Deforestation Hotspots 2021. MAAP: 153.

2016. This PDF was generated from MAAPROJECT.org MAAP is developed by Amazon Conservation Association (ACA) and Conservación Amazónica (ACCA) All use is Open-Access, but must contain an attribution link back to maaproject.org or the citation at the end of the article.