



Designed to register and validate the environmental status of rural properties, the CAR is self-declaratory, which facilitates its misuse by landowners who register fractions of public forests as their own. Even though this practice has no value to prove land ownership, it is an initial stage in the undue invasion process, motivated by real estate speculation.

The advance of land grabbing has not only socio-environmental but also economic implications. The illegal deforestation of the forests represents a robust threat to the climatic balance of the region, with direct negative consequences for agricultural production, the protection of water resources, fire control, and the well-being of the population. The advance of destruction may further aggravate Brazil's already poor image before the international community and investors. Halting deforestation in the UPFs is therefore urgent.

In this technical note, we present the most recent and complete mapping and analysis of the dynamics of land grabbing affecting undesignated public forests in the Amazon biome, showing the advance of deforestation and fire in the last five years.

## Method

To understand how illegal activities linked to land grabbing impact the UPFs, we used the sequence of historical data from the Brazilian Forest Service's National Registry of Public Forests covering the period from 2016 to 2020<sup>3</sup>. We also identified and excluded the overlapping areas inside the UPFs with other land categories already

officially designated, considering these areas of military use<sup>3</sup> and rural settlements<sup>4</sup>, conservation units<sup>5</sup>, indigenous lands<sup>6</sup>, *quilombola* areas<sup>7</sup>, and rural properties certified by SIGEF<sup>7</sup>.

In addition, we assessed the evolution of DETER deforestation alerts and hotspots extracted from the National Institute for Space Research's (INPE) Burn and Forest Fire Monitoring Portal database<sup>9</sup> to measure deforestation and fires in the selected period (2016 to 2020). DETER was used here as an indicator of illegal logging because its data allow for a more up-to-date outlook of the deforesting situation in the region in more recent time intervals (second half of 2020, for example). We also calculate the deforestation rate for the first quarter of 2021. Despite being a warning data, DETER points out credible deforestation trends confirmed later by INPE's other deforestation monitoring system, PRODES. DETER values, however, are underestimated compared to PRODES.

To measure and map the size of land grabbing, we adopted the number and area of illegally registered in the CAR System over the UPFs as an indicator. Therefore, we used the CAR database for the last five years (2016-2020) in the National Rural Environmental Registry System (SICAR)<sup>10</sup>. To avoid duplicity, we eliminated possible overlaps between CAR declared concerning the UPFs. Our analyses did not account for fractions of CAR overlapping with other land categories.

The registrations were then distributed by size classes, using the fiscal module as a reference, which varies according to the

1. Law No. 11,284, of March 2, 2006. Provides for the management of public forests for sustainable production, establishes the Brazilian Forest Service within the administrative framework of the Ministry of Environment, and creates the National Forest Development Fund.

2. See <https://www.florestal.gov.br/cadastro-nacional-de-florestas-publicas> (in Portuguese).

3. Available at <https://www.florestal.gov.br/cadastro-nacional-de-florestas-publicas> (in Portuguese).

4. Available at <https://certificacao.incra.gov.br/> (in Portuguese).

5. Available at <http://mapas.mma.gov.br/i3geo/datadownload.htm> (in Portuguese).

6. Available at <http://www.funai.gov.br/> (in Portuguese).

7. Available at <https://certificacao.incra.gov.br/> (in Portuguese).

municipality, from 75 to 100 hectares. This distribution included three classes: (1) <4 modules; (2) from 4 to 15 modules; and (3) > 15 fiscal modules.

Deforestation and hotspots data from the year 2016 to March 2021 were then crossed with the UPFs base and the CAR data overlaid on them. Thus, it was possible to generate statistics of the annual dynamics of forest loss and fires in UPFs and measure the fractions of deforestation and fires in areas registered in the CAR System. Finally, the result of this analysis was distributed among the Amazonian states.

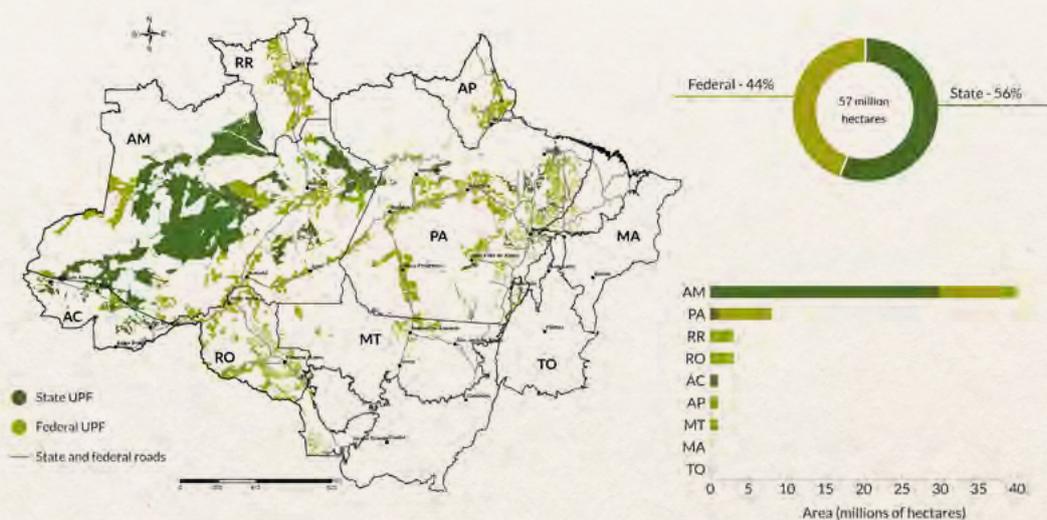
## Results

### Size and characteristics

The undesignated public forests (UPFs) currently cover 57.5 million hectares, more than the entire territory of Spain. Together, they make up 14% of the Amazon biome area.

The majority (56% of this area, which means 32.2 million hectares) is state domain, and the remainder (44%; or 25.3 million hectares) is the federal domain (figure 1, table 1). The largest area of UPFs is concentrated in Amazonas (69%), while there are few undesignated public forests in the portion of the Amazon biome in Maranhão and Tocantins (table 1).

In general, 26% of federal UPFs area is located within the 20 kilometers range of major national and state highways in the region, while less than 2% of state UPFs area is within this same range (figure 1). The vicinity of federal UPFs to highways and the consolidation and expansion of property deforestation give these areas a more fragmented characteristic and in smaller polygons when compared to state UPFs concentrated in extensive territorial highlands, mainly in Amazonas (figure 1).



**Figure 1.** UPF distribution in the Amazon biome, by domain (state and federal) and by state.

Source: IPAM, based on SFB data.

8. Available at <http://terrabrasilis.dpi.inpe.br/en/download-2/>.

9. Available at <http://queimadas.dgi.inpe.br/queimadas/bdqueimadas> (in Portuguese).

10. Available at <https://www.car.gov.br/publico/imoveis/index> (in Portuguese).

11. This figure is lower than that reported in the SFB's Public Forest Registration because, as mentioned above in the methods section, we eliminated the overlaps of these forests with other land categories already designated.

**Table 1.** UPF area distribution by state and domain in the Amazon biome.

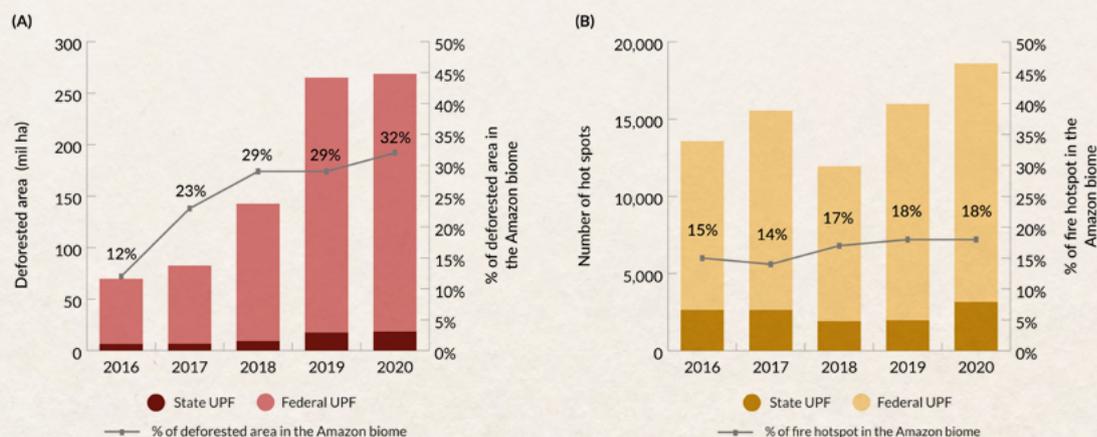
Source: IPAM, based on SFB data.

State	State FPND (in hectares)	Federal FPND (in hectares)	Total area of FPND (in hectares)	% of total FPND area
AM	29,878,437	9,880,397	39,758,834	69%
PA	1,038,307	6,958,447	7,996,754	14%
RR	58	2,989,144	2,989,202	5%
RO	0	2,601,013	2,601,013	5%
AC	1,233,320	477,462	1,710,782	3%
AP	68,811	1,250,346	1,319,157	2%
MT	575	1,004,183	1,004,758	2%
MA	0	120,772	120,772	0.2%
TO	0	9,190	9,190	0.02%
<b>Total</b>	<b>32,219,507</b>	<b>25,290,956</b>	<b>57,510,462</b>	<b>100%</b>

## Deforestation and fire

The undesignated public forests (UPFs) have a considerable concentration of deforestation alerts in the Amazon compiled by DETER. In 2020, for example, these areas accounted for 32% of deforestation in the biome - in 2019, the contribution was already high (29%) (figure 2).

Over the past five years, there has been an increase in deforestation alerts inside the UPFs (figure 2). The most significant increase in the deforested area occurred between 2018 and 2019: there was a 122,271 hectares difference, which means a 185% increase, stabilizing the index at this new level in 2020 (figure 2). In all years considered, deforestation in the UPFs was



**Figure 2.** Charts of the evolution of deforestation and fire alerts in federal and state UPFs between 2016 and 2020. Source: IPAM, based on SFB and INPE data.

concentrated primarily in federal designated forests – the state UPFs accounted, on average, for only 7% of the total annual deforestation recorded (figure 2).

In the first quarter of 2021, 33% of the biome’s deforestation recorded by DETER occurred inside the UPFs, a contribution similar to that recorded in the first quarter of 2020.

In 2020, almost half of deforestation in UPFs occurred in Pará (46%). Amazonas and Rondônia followed close, with annual rates of 24% and 18%, respectively. Except for Acre, most deforested UPFs are in the federal domain (figure 3).

The number of hotspots inside the UPFs has shown a tendency to increase in the five years studied, despite a drop recorded between 2017 and 2018. This is true especially from 2018, with a higher prevalence of fire in federal forests than state forests (figure 2, table 2).

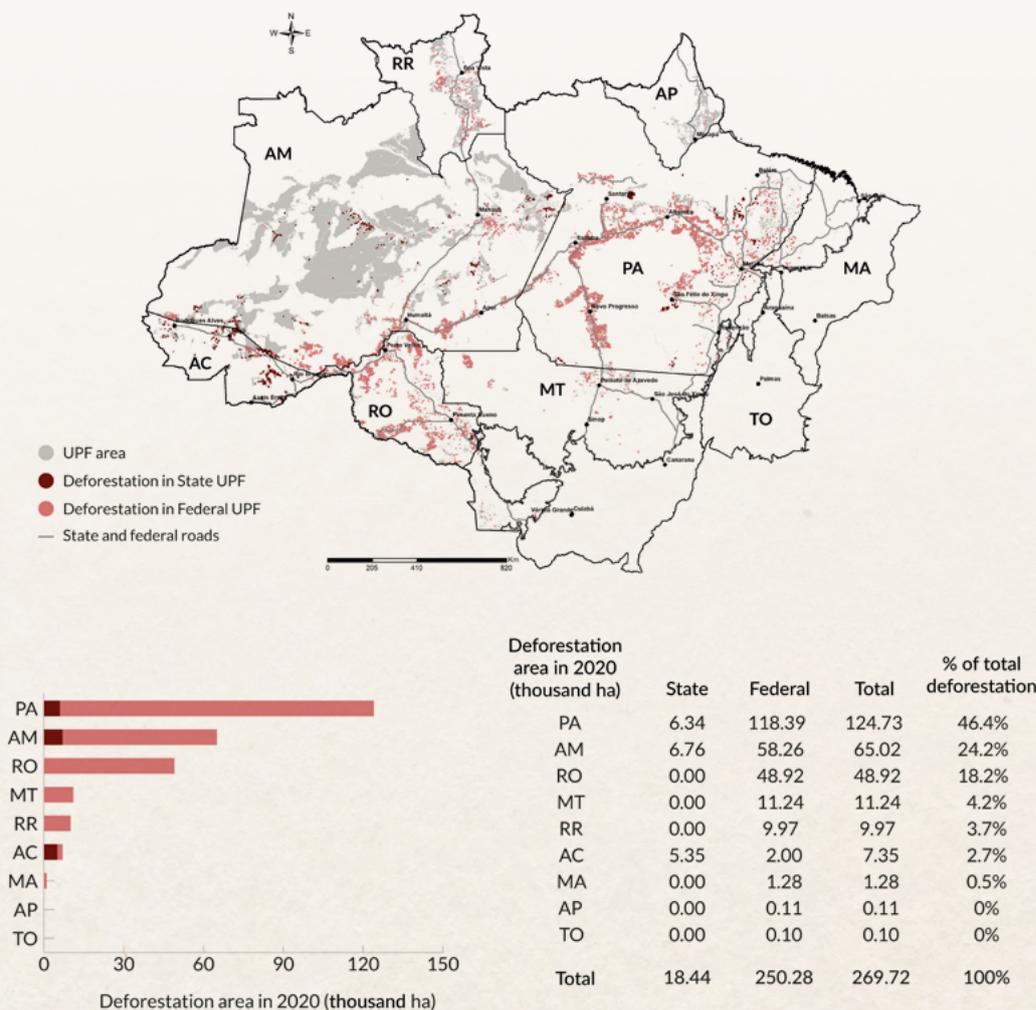


Figure 3. Deforestation in the UPFs by state in 2020. Source: IPAM, based on SFB and INPE data.

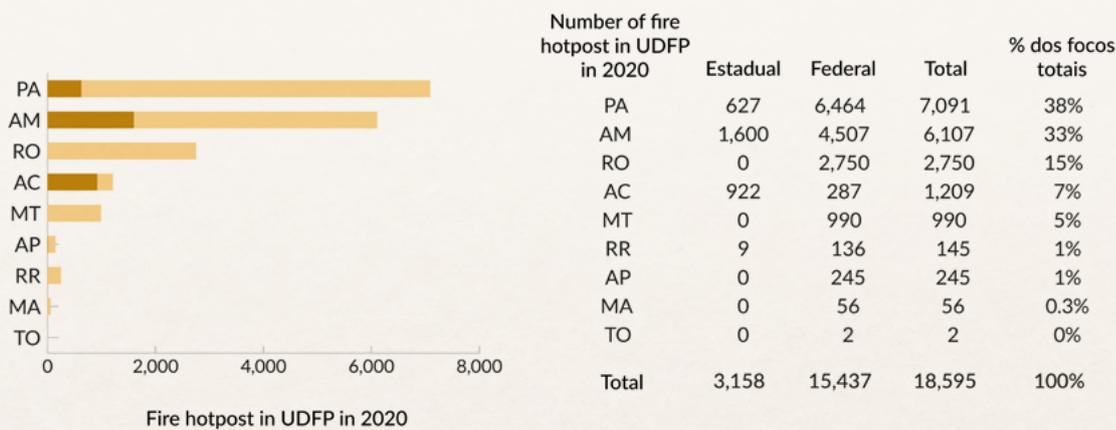
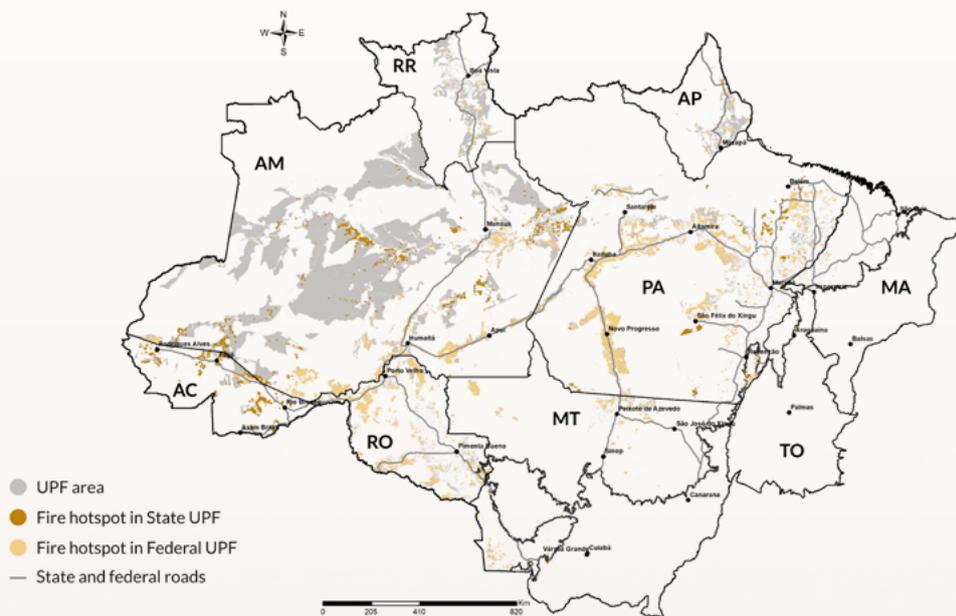


Figure 4. Hotspots in the UPFs by state in 2020. Source: IPAM, based on SFB and INPE data.

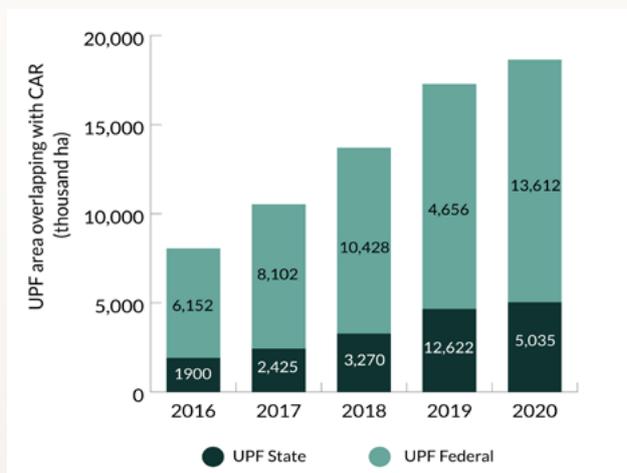
The UPFs concentrated figures around 18% of the number of fires occurring in the Amazon biome in 2019 and 2020 (Fellows *et al.*, 2021). Pará, Amazonas, and Rondônia were the states with the most hotspots inside the UPFs in 2020 (38%, 33%, and 15%, respectively).

Acre was the only state with more hotspots in state UPFs than in federal forests (figure 4), as observed in the deforestation analyses.

## Irregular Rural Environmental Registry

By 2020, 18.6 million hectares of un-designated public forests were illegally declared private property by alleged owners in the National Rural Environmental Registry (CAR) System. **This represents 32% of the total area of UPFs in the Legal Amazon.**

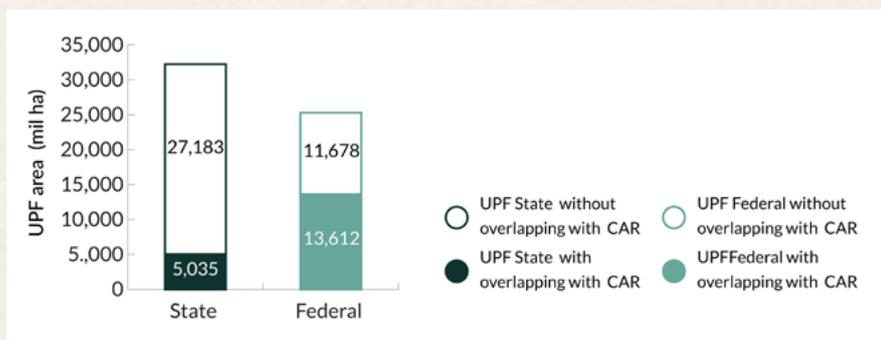
**Compared to 2016, the area registered in the CAR System inside the UPFs increased by 232%.** There was a higher incidence of registrations in the federal domain areas (figure 5). These illegal registrations represent a relevant indication of land grabbing.



**Figure 5.** Evolution of overlapping areas registered in the CAR System located inside state and federal UPFs between 2016 and 2020. *Source: IPAM, based on SFB data.*

It was no different in 2020: 73% of irregular registrations, amounting to 13.6 million hectares, are concentrated inside federal domain areas (figures 6 and 7). The land speculation strategy was focused mainly on the states of Amazonas and Pará (35%

and 32% of the illegal areas registered in the CAR, respectively). In Amazonas and Acre only, the area registered irregularly was equal or greater in forests of state domain than in those of federal domain (figure 7).



**Figure 6.** Size comparison of UPFs with and without overlapping areas registered in the CAR System by state by the jurisdiction in 2020. *Source: IPAM, based on SFB data.*

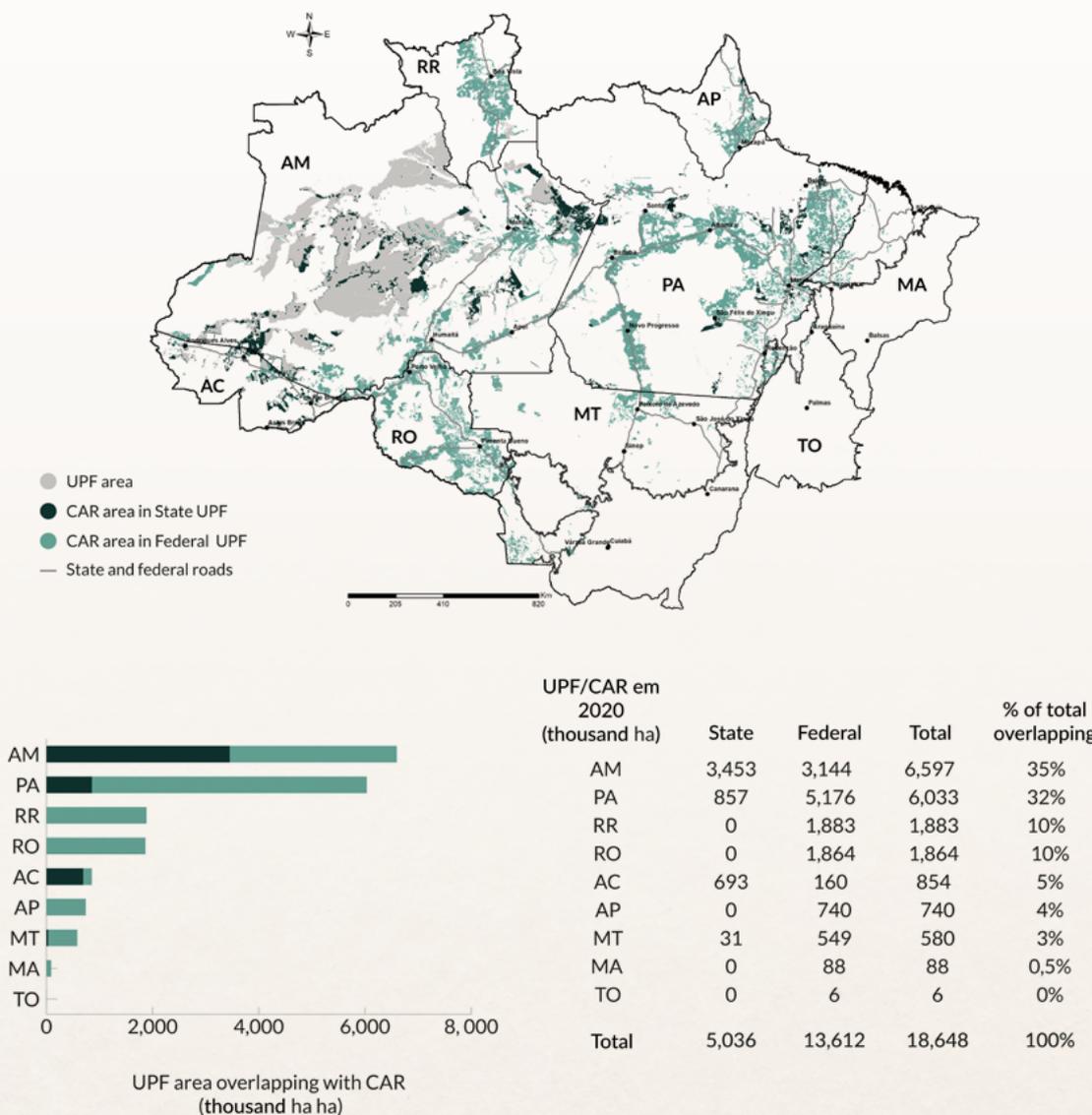
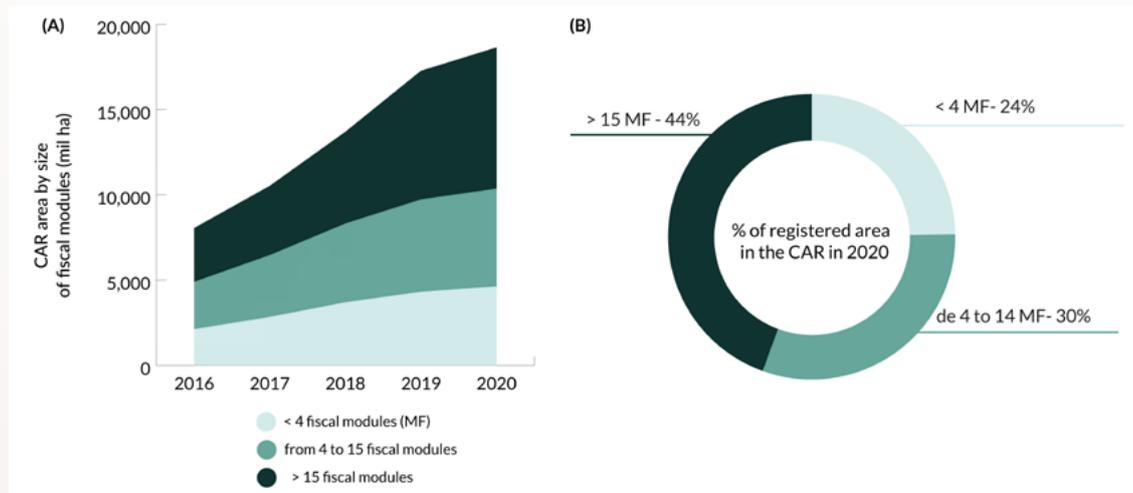


Figura 7. FPND area overlapping with CAR by state in 2020. Source: IPAM, based on SFB data.

In 2020, 44% of entries in the CAR overlapping with UPFs were of large areas (> 15 fiscal modules). Since 2016 (figure 8), this pattern has been maintained, indicating

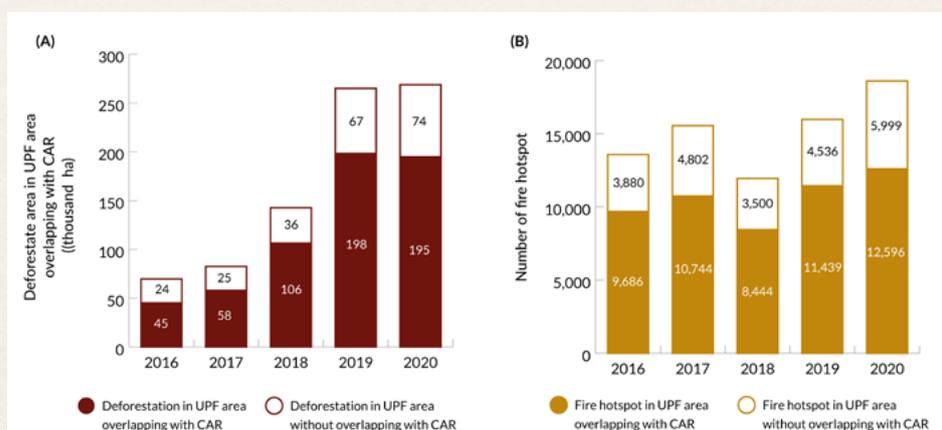
that land speculation has been practiced mostly by people with financial resources rather than small posseiros (squatters).



**Figure 8.** Area size of registered areas in the CAR overlapping with UPFs by fiscal module size; this data does not exclude overlaps between entries. *Source: IPAM, based on SFB data.*

From 2016 to 2020, both deforestation and fire hotspots within UPFs were higher in areas registered in the CAR than those without registration, respectively 2.5 and 2.2 times higher, on average (figure 9). In the first quarter of 2021, 79% of

the deforestation recorded in the UPFs occurred in overlapping areas registered in the CAR, and almost all (99%) were found on federal lands. In the previous year, 2020, this percentage was 75%, or 4% less than in 2021.



**Figure 9.** Deforestation and fire evolution in the area registered in the CAR System inside the UPFs. *Source: IPAM, based on SFB and INPE data.*

## Discussion

The results clearly indicate the progressive invasion of public forests as the nerve center of illegal deforestation in the Amazon biome, especially in the last two years (figure 9). If illegality was previously concentrated in rural properties that advanced into forests, not even respecting the fences with no permit to deforest, today we observe another intense movement: concerning institutionalized land grabbing, which moves forward over public assets.

The most serious issue is that the advance of the illegal deforestation has been facilitated by the improper use of the CAR System, which is an instrument for environmental – not for land – regularization. The significant increase in the logging of public forests overlapping areas declared in the official system, especially in 2019 and 2020, reinforces the misuse of this instrument governed by the Forest Code.

Even though it has no valid means to prove ownership, the CAR facilitates obtaining funds from third parties or financial institutions that enable illegal occupation and deforestation. Such funds are vital, as the forest logging of one hectare requires considerable investment: according to the Federal Prosecutor's Office, the amount is "at least R\$800 per hectare, but can reach R\$2,000" (Girardi, 2019).

This cost, confronted with the impressive volume (44%) of large areas registered in the CAR System (>15 fiscal modules) on UPFs, gives the dimension of the resources potentially leveraged by land grabbing in the region. Considering the costs of

deforestation, in 2020 alone, the illegal occupation of the land must have moved something around R\$ 215.2 million, at least, to deforest 269,000 hectares.

Therefore, land grabbing requires a considerable source of financial resources, whether legal or illegal. What is more: it is a crime that seems to pay off since the financial return from the sale of illegally grabbed public property can be high.

It is also worth reflecting that the advance of undue registrations in the CAR System is a "time bomb" for future deforestation. Considering that there are already 18.6 million hectares registered in the CAR overlapping with UPFs and considering that the use of CAR to enable illegal occupation of land is increasing, deforestation in these public forests may reach more than half of the annual forest destruction in the Amazon.

The process of new illegal registrations of areas overlapping with UPFs in the National Rural Environmental Registry (CAR) System should be urgently interrupted; the existing registrations should be evaluated and immediately treated, including registry cancellation in the states' databases, making use of ordinances or normative instructions for their respective land institutes. Promising spaces to continue with these cancellations is emerging. One of them is the group of the National Council of Justice and the Interstate Consortium for Sustainable Development of the Amazon, which discusses the advance with the proper destination of UPFs.

In many ways, the advance of land

grabbing in the Amazon can cause serious future socio-environmental and economic damage to the region and the country and, without exaggeration, to the international community. The combination of deforestation, fire, and forest degradation could put the Amazon forest as a whole in a process that scholars call the “tipping point,” or point of no return (Lovejoy and Nobre, 2019). The accelerated advance on public forests brings the region closer to this situation.

It is estimated that a deforestation index above 20% to 30% in the region will set in motion a process of degradation of the ecological functions that sustain the forest as we know it today. Currently, almost 20% of the original area has already been chop down. One of these essential services is the negative impact on the rainfall regime that fuels the agricultural economy of the Amazon and other parts of the country – fewer trees mean longer and more severe droughts (Leite-Filho *et al.*, 2019). Economic losses from decreased biological diversity and the occurrence of forest fires could be on the scale of billions of reais.

Losses resulting from carbon emissions from deforestation and wildfires portrait the country’s image before the international community in an even worse situation than it already is. Considering the advancing rate of land grabbing in the Amazon, without an effective and immediate fight, Brazil will not be able to fulfill its commitments to reduce greenhouse gas emissions under the Paris Agreement – certainly not what President Jair Bolsonaro promised at the April 2021 Climate Leaders’ Summit, including zero

illegal deforestation by 2030.

Ending land grabbing in the UPFs is a fundamental and urgent need for the country to continue attracting investments, signing international agreements, and regaining global respect.

Illegality thrives where the inertia of the federal and state governments in promoting the destination of their UPFs, as established by the Public Forest Management Law of 2006, for as long as the operational difficulties remain in the government command and control institutions, besides those organizations responsible for land regularization in acting with rigor and institutional support to enforce the legislation.

To avoid land grabbing to continue moving forward into the UPFs and to prevent the intensification of the threat to the climate and the Brazilian goals, it is fundamental that:

- **The gradual weakening of federal institutions such as IBAMA, INCRA, INPE, and ICMBio, currently underway, be halted and quickly reversed.** It is necessary to seek broad recognition of the efforts of the Federal Police in fighting land grabbing and supporting the control agencies.
- **The debate on landholding regularization in the Amazon must be done transparently and broadly,** involving all stakeholders so that the wheat is separated from the chaff, and land grabbers are not benefited in small producers’ name squatters and traditional occupants. The 510/2021 bill, under debate in the Brazilian Senate, is a clear example

of how an unrestricted amnesty for illegal occupants benefits past illegality and stimulates the maintenance of criminal schemes concerning the UPFs, and it should be shelved.

- **All Rural Environmental Registry (CAR) regarding UPFs should be immediately reviewed and canceled**, without prejudice, to recognize collective territories and traditional occupation.

- **The UPFs allocation should be given to conservation units and indigenous lands and national forests for sustainable exploitation** after a comprehensive public hearing system involving the populations present in those areas.

- **Operations on logging or timber exploration, seizure of illegal equipment, and embargoes of areas should be transparent and public** so that the consequences of illegal environmental actions committed in these areas are exposed and discourage further land grabbing.

## Acknowledgments

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