

Heron Martins, Antônio Fonseca; Carlos Souza Jr.; Márcio Sales & Adalberto Veríssimo (Imazon)

SUMMARY

In November 2013, SAD detected 37 square kilometers of deforestation in the Legal Amazon. That represents a drop of 33% in relation to November 2012 when deforestation totaled 55 square kilometers. Of that total, 26% occurred in Pará, followed by Roraima (22%), Amazonas (17%) and Rondônia (17%). Due to cloud cover, it was possible to monitor only 42% of the territory while in November 2012 it was possible to monitor 50% of the Amazon.

The deforestation accumulated in the period from August 2013 to November 2013 was 368 square kilometers. There was a reduction of 70% in relation to the previous period (August

2012 to November 2012) when deforestation totaled 1,206 square kilometers.

Degraded forests totaled only 9 square kilometers in November 2013. In relation to November 2012 there was a reduction of 91% when forest degradation totaled 100 square kilometers. The great majority (60%) occurred in Mato Grosso, followed by Pará (40%).

Forest degradation accumulated during the period from August 2013 to November 2013 totaled 157 square kilometers. In relation to the previous period (August 2012 to November 2012), when forest degradation totaled 711 square kilometers, there was a reduction of 78%.

Deforestation Statistics

According to SAD, deforestation (total suppression of forest for other alternative land uses)

reached 37 square kilometers in November 2013 (Figure 1 and Figure 2).

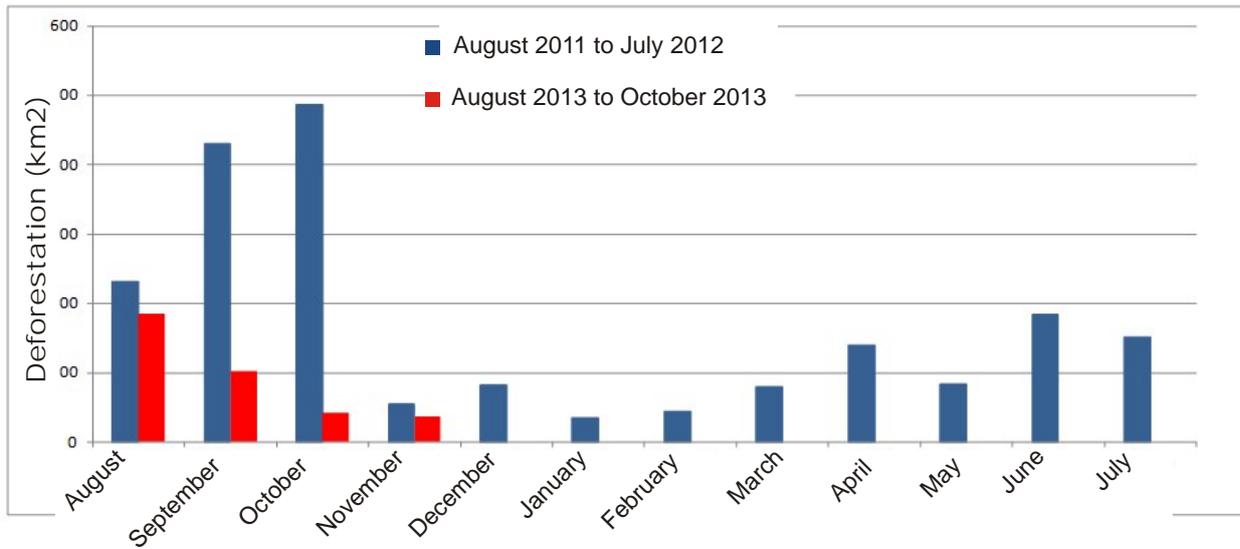


Figure 1. Deforestation from August 2012 to November 2013 in the Legal Amazon (Source: Imazon/SAD).

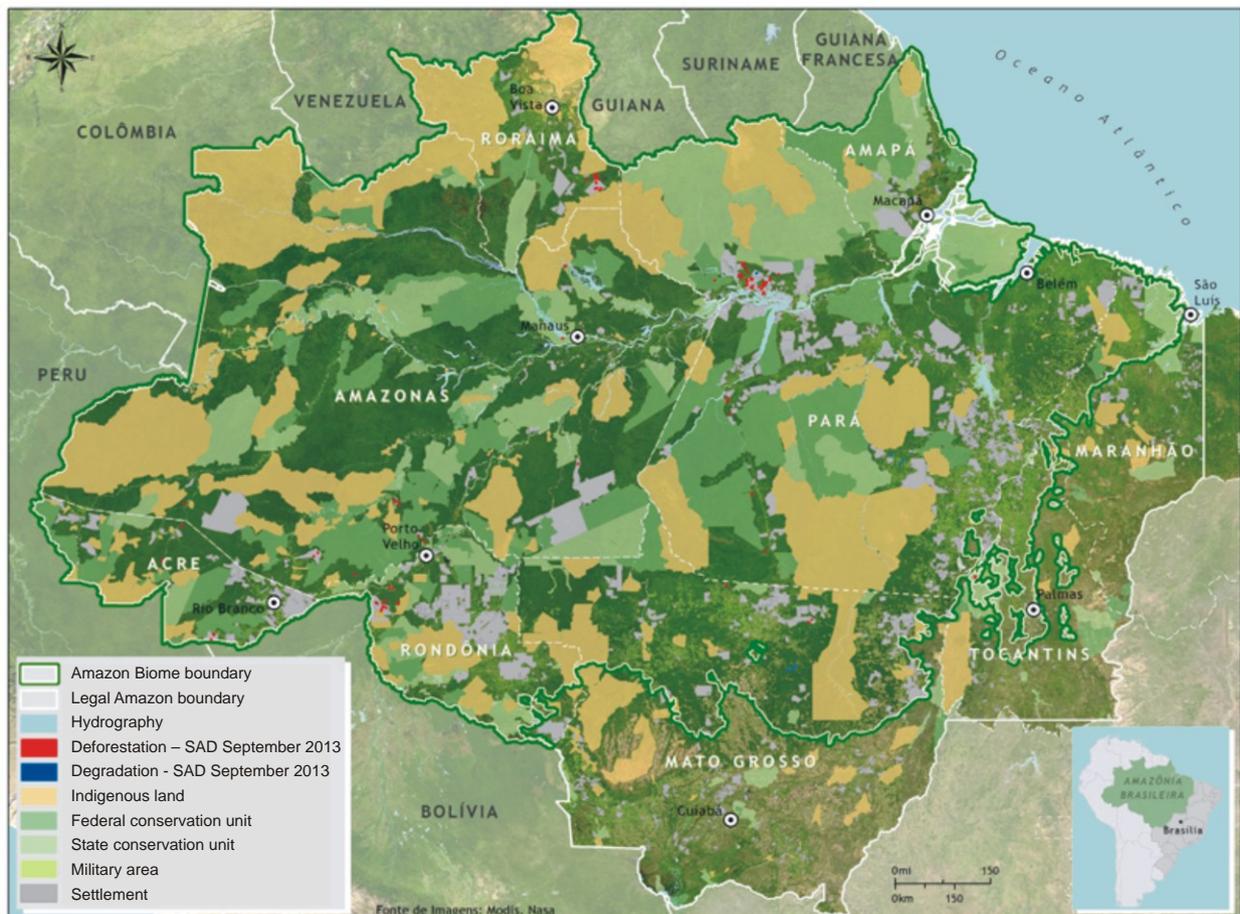


Figure 2. Deforestation and Forest Degradation in November 2013 in the Legal Amazon (Source: Imazon/ SAD).

The deforestation accumulated in the period from August to November 2013, corresponding to the first four months of the official calendar for measuring deforestation,

reached 368 square kilometers. There was a reduction of 70% in deforestation in relation to the previous period (August 2012 to November 2012) when it reached 1,206 square kilometers.

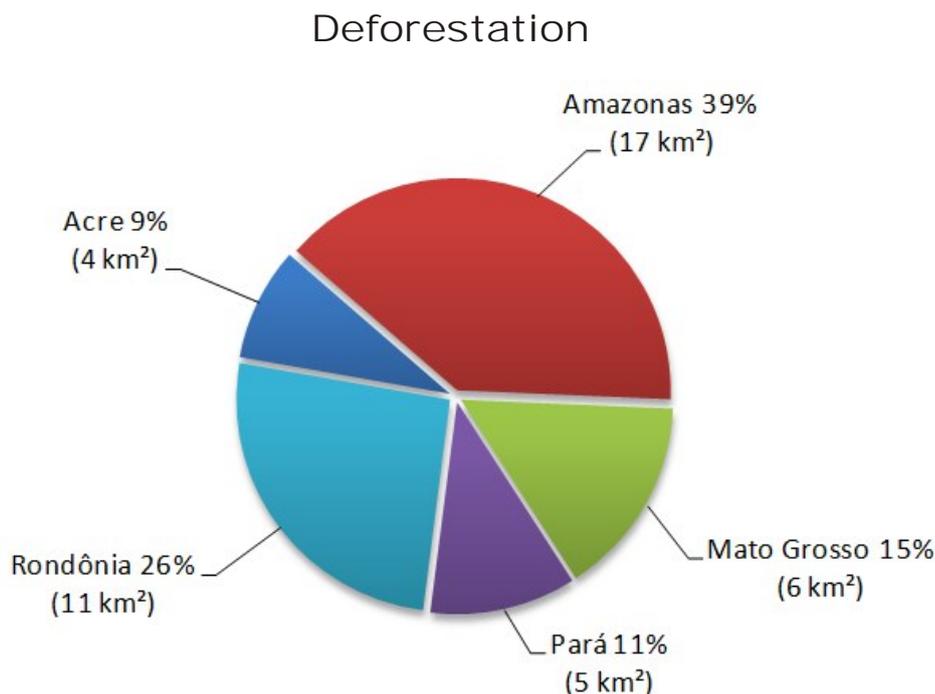


Figure 3. Percentage of deforestation in the States of the Legal Amazon Legal in November 2013 (Source: Imazon/SAD).

Considering the first four months of the current deforestation calendar (August 2013 to November 2013), Rondônia leads the ranking with 29% of the total deforested during the period. Next come Amazonas and Pará with 27% each. In relative terms, there was a 146% increase in Acre and 20% in

Roraima. On the other hand, there was a significant reduction in Mato Grosso (-88%) and Pará (-84%)

In absolute terms, Rondônia leads the ranking of accumulated deforestation with 106 square kilometers, followed by Amazonas and Pará (98 square kilometers each).

Table 1. Evolution of deforestation among States in the Legal Amazon from August 2012 to November 2013 (Source: Imazon/SAD).

State	August to November 2012	August to November 2013	Variation (%)
Pará	613	98	-84
Mato Grosso	249	30	-88
Rondônia	159	106	-34
Amazonas	147	98	-33
Roraima	7	9	+20
Acre	10	24	+146
Tocantins	21	3	-86
Amapá	-	-	-
Total	1,206	368	-70

* Data from the State of Maranhão has not been analyzed.

Forest Degradation

In November 2013, SAD recorded only 9 square kilometers of degraded forests (forests intensely exploited by timber harvesting and/or burned) (Figures 2 and 4). Of that total, the majority (60%) occurred in Mato Grosso, followed by Pará (40%).

Forest degradation accumulated during the period

from August 2013 to November 2013 (first four months of the official calendar for measuring deforestation), reached 157 square kilometers. That represents a drop of 78% in accumulated forest degradation in relation to the same previous period (August 2012 to November 2012) when forest degradation totaled 711 square kilometers (Table 2).

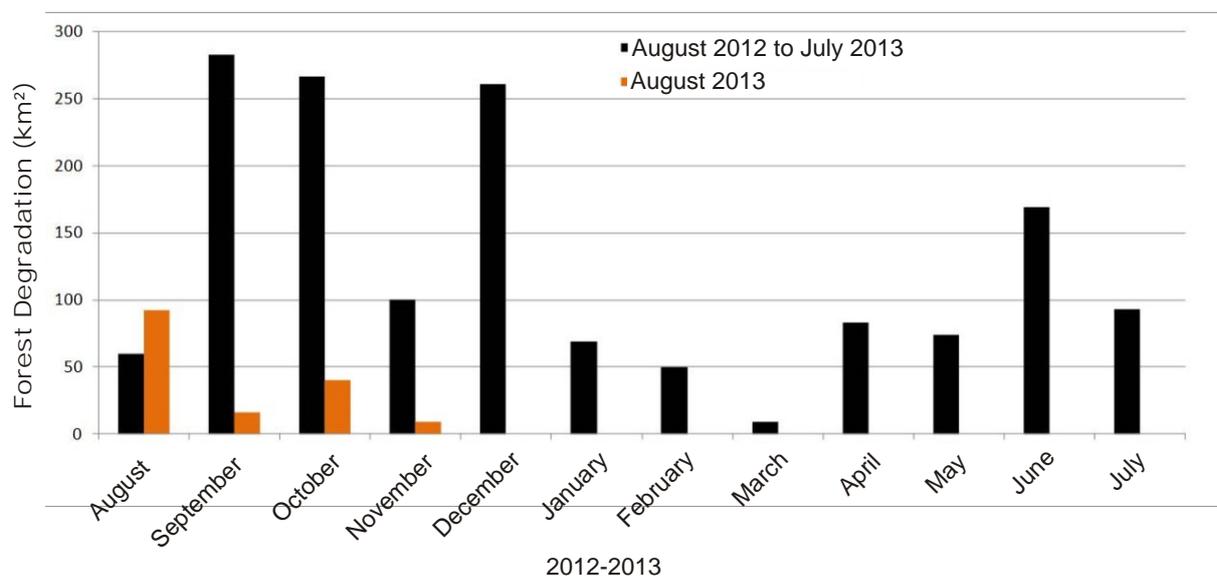


Figure 4. Forest Degradation from August 2012 to November 2013 in the Legal Amazon (Source: Imazon/SAD).

Table 2. Evolution of forest degradation among States of the Legal Amazon from August 2012 to October 2012 and August 2013 to November 2013 (Source: Imazon/SAD).

State	August to November 2012	August to November 2013	Variation (%)
Mato Grosso	283	99	-65
Pará	250	51	-85
Rondônia	48	6	-88
Amazonas	5	2	-83
Roraima	-	-	-
Acre	-	-	-
Tocantins	25	-	-
Amapá	-	-	-
Total	611	158	-78

* Data from the state of Maranhão was not analyzed.

Deforestation Geography

In November 2013, the great majority (53%) of deforestation occurred in private areas or areas under various stages of possession. The remaining

deforestation was recorded in Land Reform Settlements (32%), Conservation Units (15%) (Table 3).

Table 3. Deforestation by land category in November 2013 in the Legal Amazon (Source: Imazon/SAD).

Category	November 2013	
	km ²	%
Land Reform Settlement	12	32
Conservation Units	5	15
Indigenous Lands	-	-
Private, Possession & Untitled Lands	20	53
Total (km²)	37	100

Reform Settlements

SAD recorded 12 square kilometers of deforestation in the Land Reform Settlements in November 2013 (Figure 5). The Settlements most

affected by deforestation were PA Jatapu (Caroebe, Roraima), PA Marechal Rondon (Nova Mamoré, Rondônia) and PAE Santa Quitéria (Brasiléia, Acre).

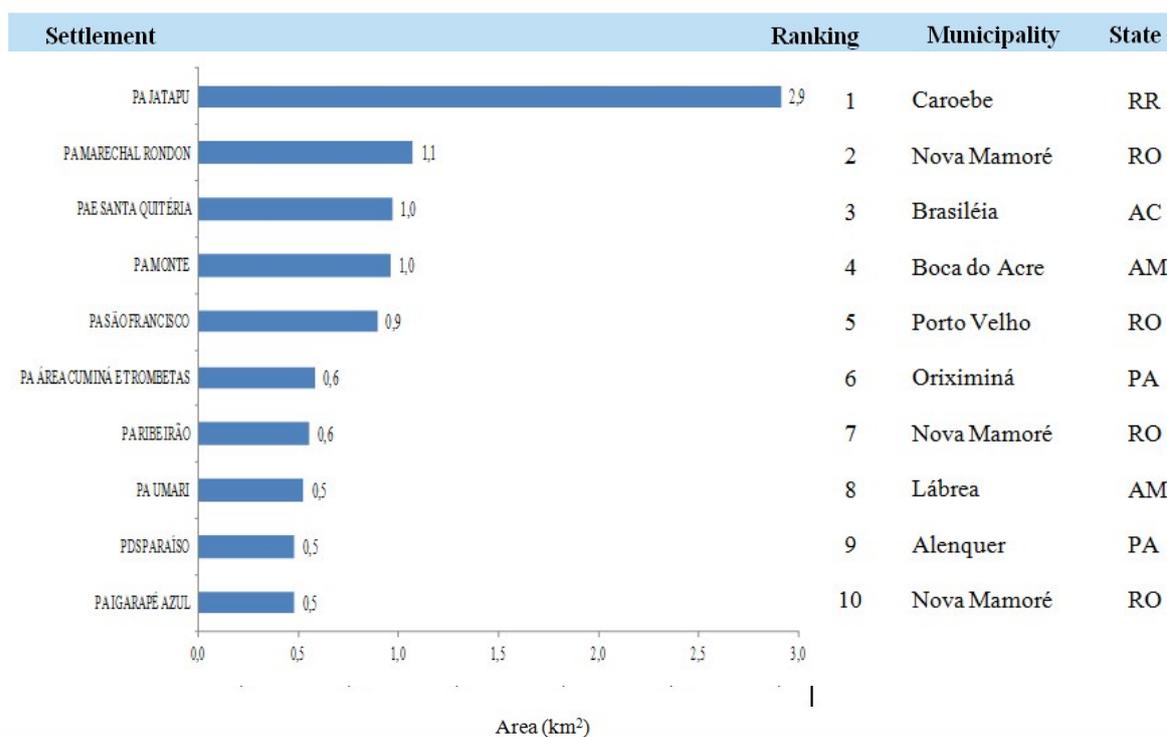


Figure 5. Land Reform Settlements deforested in November 2013 in the Legal Amazon (Source: Imazon/SAD).

Protected Areas

In the month of November 2013, SAD detected 5 square kilometers of deforestation in the Conservation

Units of (Figure 6). In the case of Indigenous Lands, in November 2013 nothing was detected in those areas.

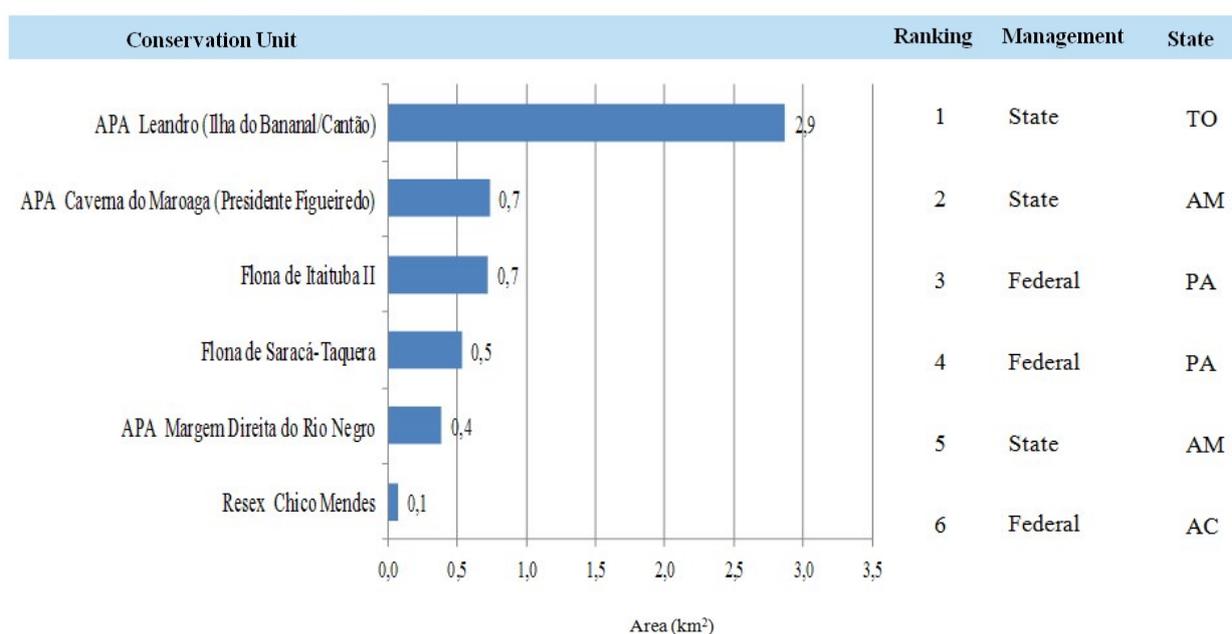


Figure 6. Conservation Units deforested in the Legal Amazon in November 2013 (Source: Imazon /SAD).

Municipalities Critics

In October 2013, the municipalities with the most deforestation were: Nova Maringá (Mato

Grosso) and Novo Progresso (Pará). (Figure 7 and 8).

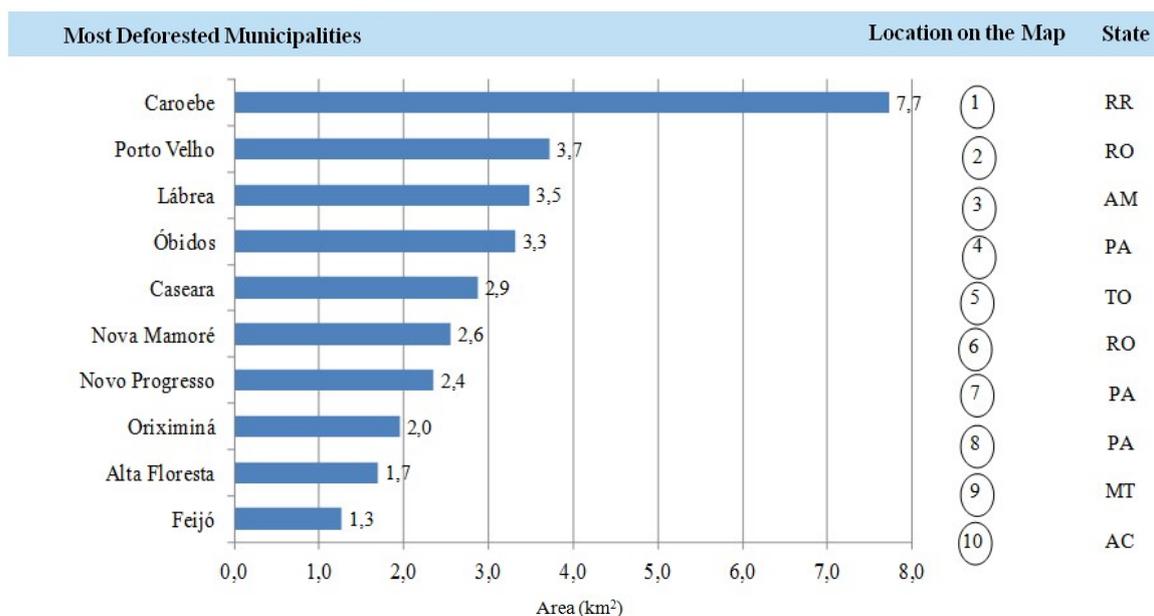


Figure 8. Municipalities with the most deforestation in the Legal Amazon in November 2013 (Source: Imazon /SAD).

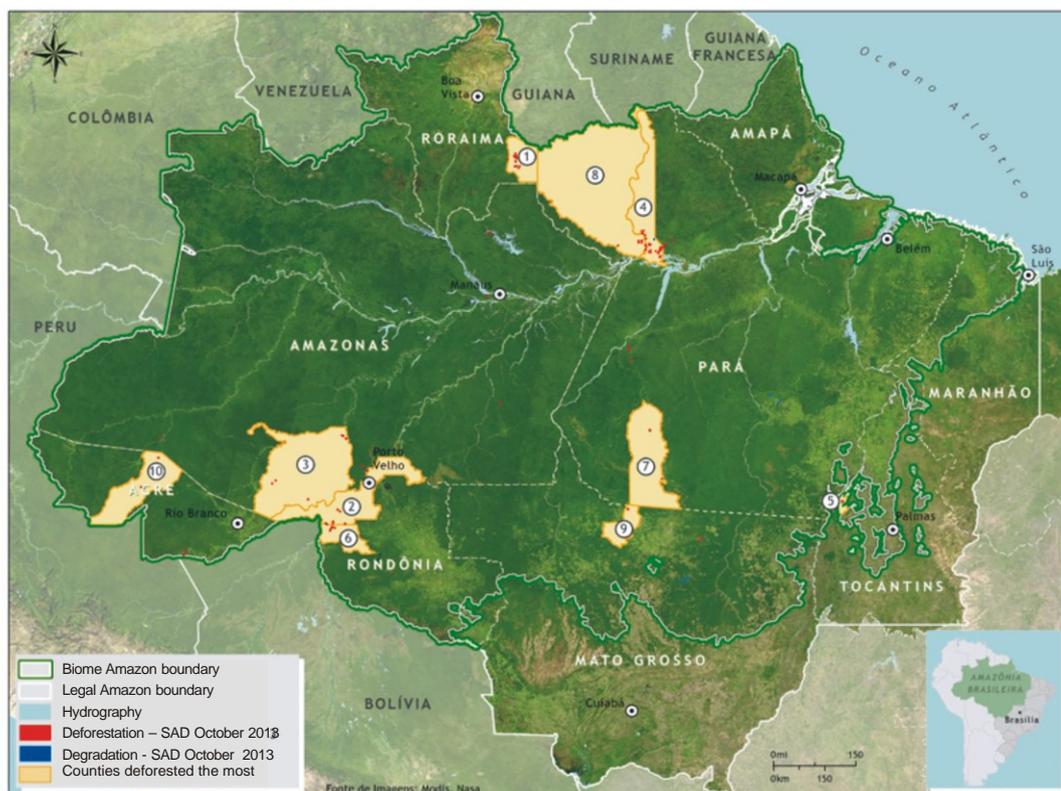


Figure 9. Municipalities with the largest areas deforested in November 2013 (Source: Imazon/SAD).

Coverage by clouds and Shade

In November 2013, it was possible to monitor with SAD only 42% of the forest area in the Legal Amazon as opposed to 50% in November 2012. The other 58% of the forest territory were covered by clouds, which made detecting deforestation and forest

degradation difficult. The States with the greatest cloud cover were Rondônia (78%), Amapá (69%) and Acre (65%). Because of that, the data on deforestation and forest degradation in November 2013 may be underestimated (Figure 9).

* Data related to the state of Maranhão, that integrates Legal Amazon, was not analyzed.

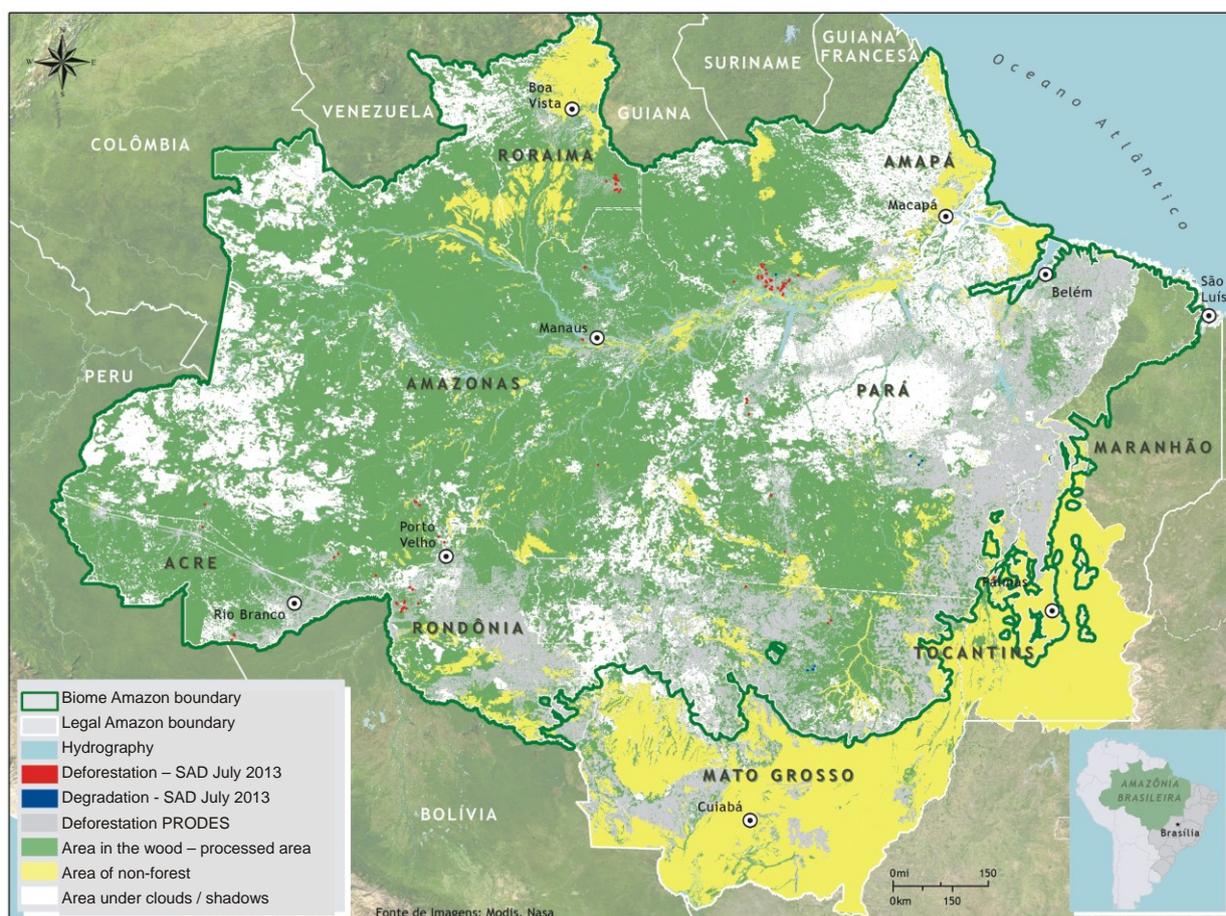


Figure 10. Area with cloud and shade in November 2013 in the Legal Amazon.

Google SAD-EE

Since June 2012 the detection of alerts of deforestation and forest degradation has been carried out in the Google's Earth Engine – EE – platform, with the new version: SAD EE. This system was developed in

collaboration with Google and uses the same process already used by SAD, with MODIS' reflectance images, in order to generate alerts of deforestation and forest degradation.

Table I: SAD 3.0

Since August 2009, SAD has been introducing some news. First, we created a graphical interface to integrate all image processing programs used in SAD. Second, we started computing deforestation in areas that were covered by clouds in the previous months, under a new class. Finally, deforestation and degradation are detected with pairs of NDFI images in a change detection algorithm. The main method remains the same as SAD 2, as described here below.

SAD generates a temporal mosaic of daily MODIS images of MOD09GQ and MOD09GA products to filter the clouds. Afterwards, we used a technique of different spectral resolution band merge, i.e., pixels of different sizes. In that case, we changed the 500 meter 5-band scale of MODIS to 250 meters. This allowed to enhance the spectral model of pixel mixture, thus supplying ability to estimate the abundance of vegetation, soils and non-active photo-synthetically vegetation (NPV, for Non-Photosynthetic, in English) components (vegetation, soil and Shadow) so to be able to calculate the NDFI with the following equation:

$$\text{NDFI} = \frac{\text{VGs} - (\text{NPV} + \text{Soil})}{\text{VGs} + \text{NPV} + \text{Soil}}$$

Where VG is the standardized component of vegetation for shadow given by:

$$\text{VGs} = \text{Vegetation} / (1 - \text{Shadow})$$

NDFI ranges from -1 (pixel with 100% of exposed soil) to 1 (pixel with >90% with forest vegetation). Thus, we could have a continuous image showing the transition from deforested areas, crossing the degraded forests, reaching the forest with no warning signs of disturbance.

Detection of both deforestation and degradation was shown this month with the difference of NDFI images related to the consecutive months. Hence, a reduction in NDFI values ranging from -200 to -50 indicates possibly cleared areas, and a reduction ranging from -49 to -20 indicates signs of degradation.

SAD 3.0 Beta is compatible with the previous versions (SAD 1.0 and 2.0), because the detection threshold of deforestation was calibrated so to generate the same type of response obtained by the former method.

SAD is already operating in the State of Mato Grosso since August 2006 and in the Amazon since April 2008. In this report, we present the monthly data generated by the SAD from August 2006 to November 2013.

Responsible staff:

General Coordination: Carlos Souza Jr and Adalberto Verissimo (Imazon)

Technical Coordination: Antonio Fonseca, Heron Martins

Team: Marcio Sales (Modelling and statistics), Rodney Salomão Amintas Brandão Jr. (GIS), João Siqueira, Marcelo Justino and Wildson Queiroz (Image interpretation), Kátia Pereira and Victor Lins (ImazonGeo), Bruno Oliveira and Stefânia Costa (Communication)

Data Source:

The deforestation statistics are generated using data from the SAD (Imazon);

INPE Data -Deforestation (Prodes)

<http://www.obt.inpe.br/prodes/>

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Google Earth Engine Team

<http://earthengine.google.org/>

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Secretariat of Environment of Mato Grosso (SEMA)

Federal Prosecutor of Pará

State Prosecutor of Pará

State Prosecutor of Roraima

State Prosecutor of Amapá

State Public Ministry of Mato Grosso

Centro de Vida Institut (ICV-Mato Grosso)