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ABSTRACT

In July 2014, SAD detected 355 square kilometers of deforestation in the Brazilian Amazon with cloud cover of 10% over the territory. That represented a 134% increase in relation to July 2013, when deforestation totaled 152 square kilometers and the cloud cover was 8%.

The deforestation accumulated during the period of August 2013 to July 2014, corresponding to the twelve months of the current deforestation calendar, totaled 2,044 square kilometers. There was a 2% increase in accumulated deforestation in relation to the previous period (August 2012 to July 2013) when deforestation totaled 2,007 square kilometers.

In July 2014, the majority (57%) of

deforestation occurred in Pará, followed by Acre (21%), Amazonas (10%), Mato Grosso (9%), Amapá (1%), Rondônia (1%) and Roraima (1%).

Degraded forests totaled 97 square kilometers in July 2014. In relation to July 2013, when forest degradation totaled 93 square kilometers, there was an increase of 5%. The great majority (81%) occurred in Mato Grosso, followed by Pará (19%).

Forest degradation accumulated during the period of August 2013 to July 2014 totaled 711 square kilometers. There was a 54 % reduction in relation to the previous period (August 2012 to July 2013) when forest degradation totaled 1,555 square kilometers.

Deforestation Statistics

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

reached 355 square kilometers in July 2014 (Figure 1 and Figure 2).

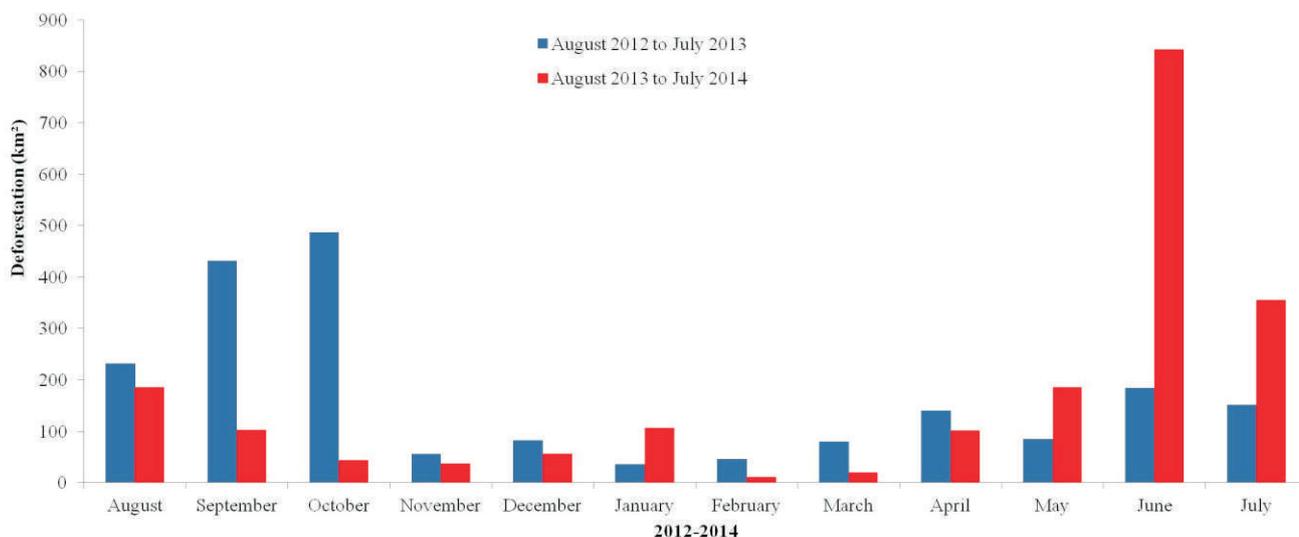


Figure 1. Deforestation from August 2012 to July 2014 in the Brazilian Amazon (Source: Imazon/SAD).

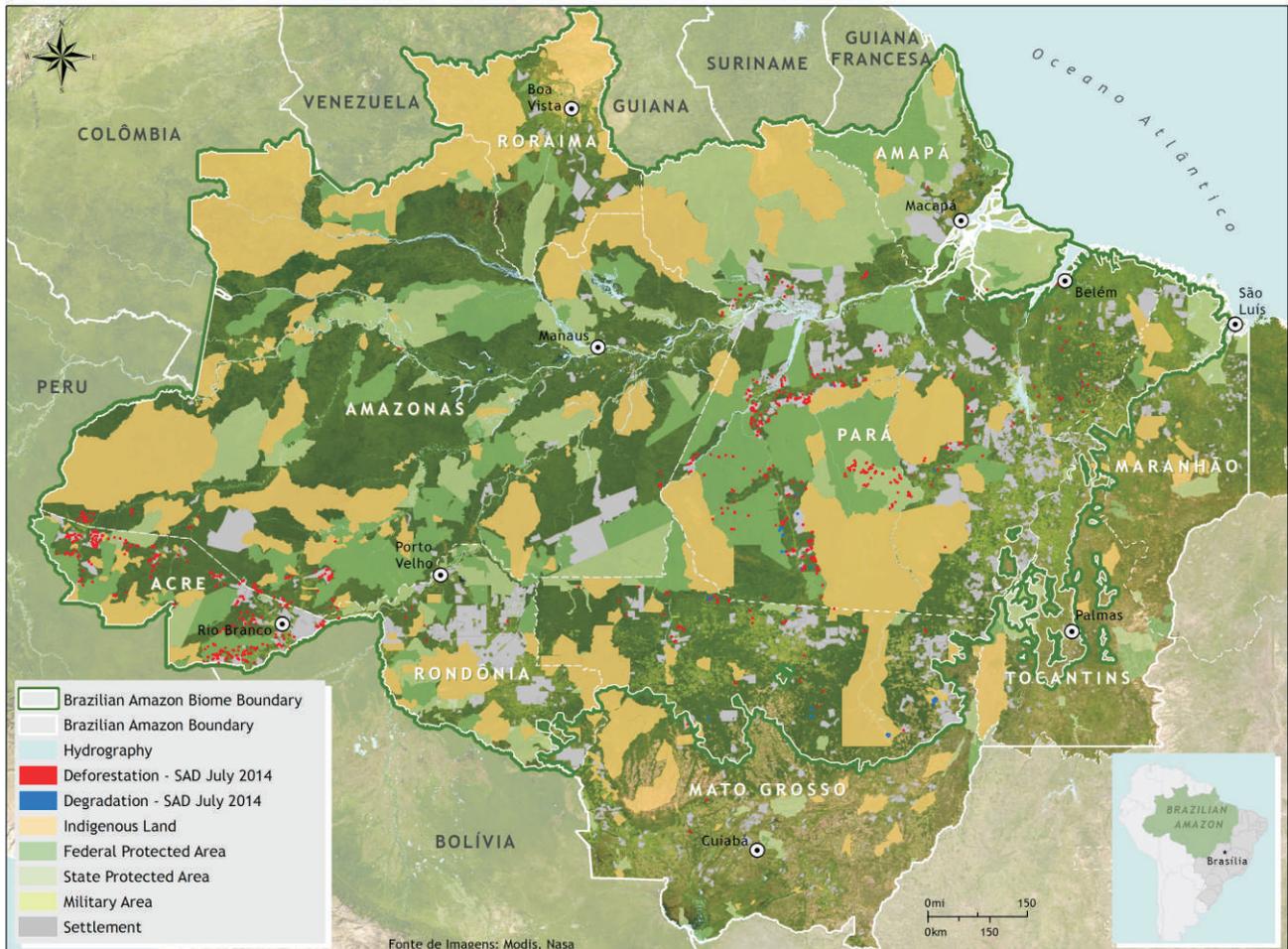


Figure 2. Deforestation and Forest Degradation in July 2014 in the Brazilian Amazon (Source: Imazon/ SAD).

Deforestation accumulated during the period of August 2013 to July 2014, corresponding to the first twelve months of the official calendar for measuring deforestation, reached 2,044 square kilometers. There was a 2% reduction in deforestation in relation to the previous period

(August 2012 to July 2013) when it reached 2,007 square kilometers.

In July 2014, the majority (57%) of deforestation occurred in Pará, followed by Acre (21%), Amazonas (10%), Mato Grosso (9%), Amapá (1%), Rondônia (1%) and Roraima (1%).

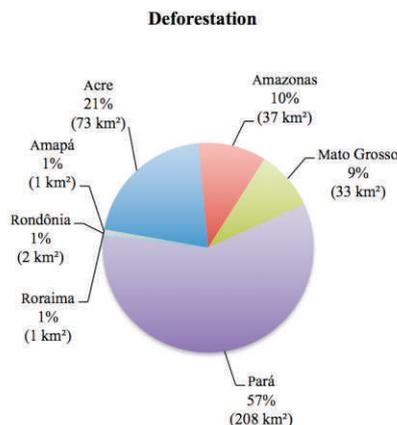


Figure 3. Percentage of deforestation in States of the Brazilian Amazon in July 2014 (Source: Imazon/SAD).

Considering the period from August 2013 to July 2014, Pará leads the ranking, with 42% of the total deforested. Mato Grosso comes next with 20% and Amazonas with 15%. In relative terms, there was an increase of 781% in Acre and 241% in Roraima. On the other hand, there was a reduction

in Mato Grosso (34%) and Tocantins (6%).

In absolute terms, Pará leads the ranking of accumulated deforestation with 852 square kilometers, followed by Mato Grosso (411 square kilometers) and Amazonas (309 square kilometers).

Table 1. Evolution of deforestation among the States of the Brazilian Amazon from August 2012 to July 2013 and August 2013 to July 2014 (Source: Imazon/SAD).

State	August 2012 to July 2013	August 2013 to July 2014	Variation (%)
Pará	810	852	+5
Mato Grosso	621	411	-34
Rondônia	247	266	+8
Amazonas	273	309	+13
Roraima	19	64	+241
Acre	13	119	+781
Tocantins	24	22	-6
Amapá	-	1	-
Total	2.007	2.044	+2

*Data from Maranhão state has not been analyzed.

Forest Degradation

In July 2014, SAD recorded 97 square kilometers of degraded forests (forests intensely exploited by logging activity and/or burned)

(Figures 2 and 4). Of that total, the majority (81%) occurred in Mato Grosso, followed by Pará (19%).

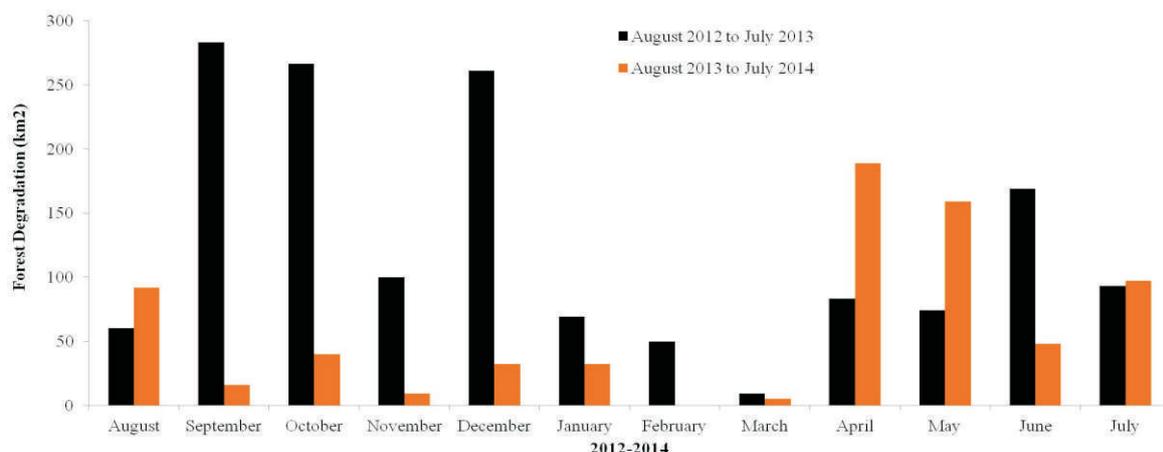


Figure 4. Forest Degradation from August 2012 to July 2014 in the Brazilian Amazon (Source: Imazon/SAD).

Forest degradation accumulated in the period from August 2013 to July 2014 (all twelve months of the official calendar for measuring deforestation¹), reached 711 square kilometers. That represents 54%

reduction in accumulated forest degradation in relation to the same previous period (August 2012 to July 2013), when a forest degradation totaled 1,555 square kilometers (Table 2).

Table 2. Evolution of forest degradation among the States of the Brazilian Amazon from August 2012 to July 2013 and August 2013 to July 2014 (Source: Imazon/SAD).

State	August 2012 to July 2013	August 2013 to July 2014	Variation (%)
Mato Grosso	752	568	-82
Pará	616	93	-85
Rondônia	128	43	-66
Amazonas	24	4	-82
Roraima	8	3	-64
Acre	3	-	-97
Tocantins	25	-	-100
Amapá	-	-	-
Total	1.555	711	-54

*Data from Maranhão has not been analyzed.

Geography of Deforestation

In July 2014, the great majority (57%) of deforestation occurred in areas that were private or under various stages of possession. The remaining

deforestation was recorded in Land Reform Settlements (22%), Conservation Units (20%) and Indigenous Lands (1%) (Table 3).

Table 3. Deforestation by land title category in July 2014 in the Brazilian Amazon (Source: Imazon/ SAD).

Category	July 2014	
	km ²	%
Land Reform Settlement	78	22
Conservation Units	71	20
Indigenous Lands	4	1
Private, Possession & Untitled Public Lands	202	57
Total (km²)	355	100

¹ The official calendar for measuring deforestation has beginning in August and ends in July.

Land Reform Settlements

SAD recorded 78 square kilometers of deforestation in Land Reform Settlements in July 2014 (Figure 5). The Settlements most affected by

deforestation were PA Monte (Boca do Acre, Amazonas), PDS Jamil Jereissati (Cruzeiro do Sul, Acre) and PAD Santa Luzia (Cruzeiro do Sul, Acre).

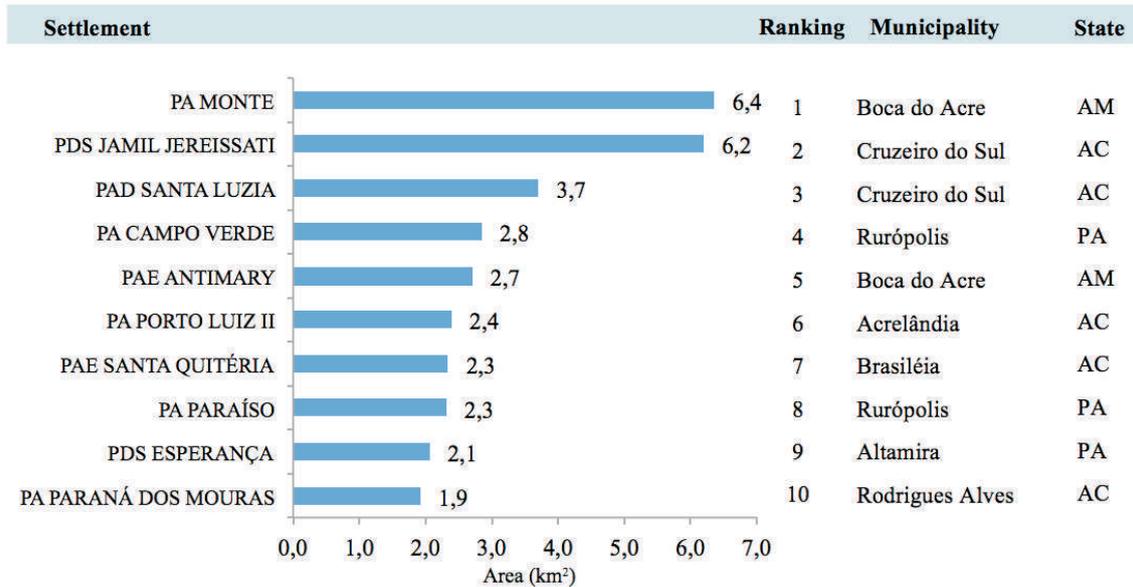


Figure 5. Land Reform Settlements deforested in July 2014 in the Brazilian Amazon (Source: Imazon/SAD).

Protected Areas

In the month of July 2014, SAD detected 71 square kilometers of deforestation in Conservation Units (Figure 6). In July 2014 4

square kilometers of deforestation were detected in Indigenous Lands (Figure 7).

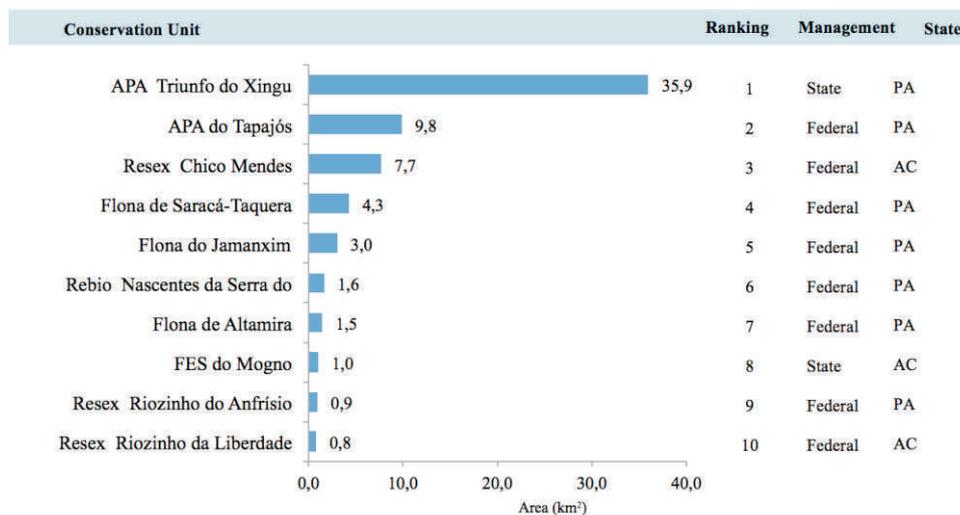


Figure 6. Conservation Units deforested in the Brazilian Amazon in July 2014 (Source: Imazon/SAD).

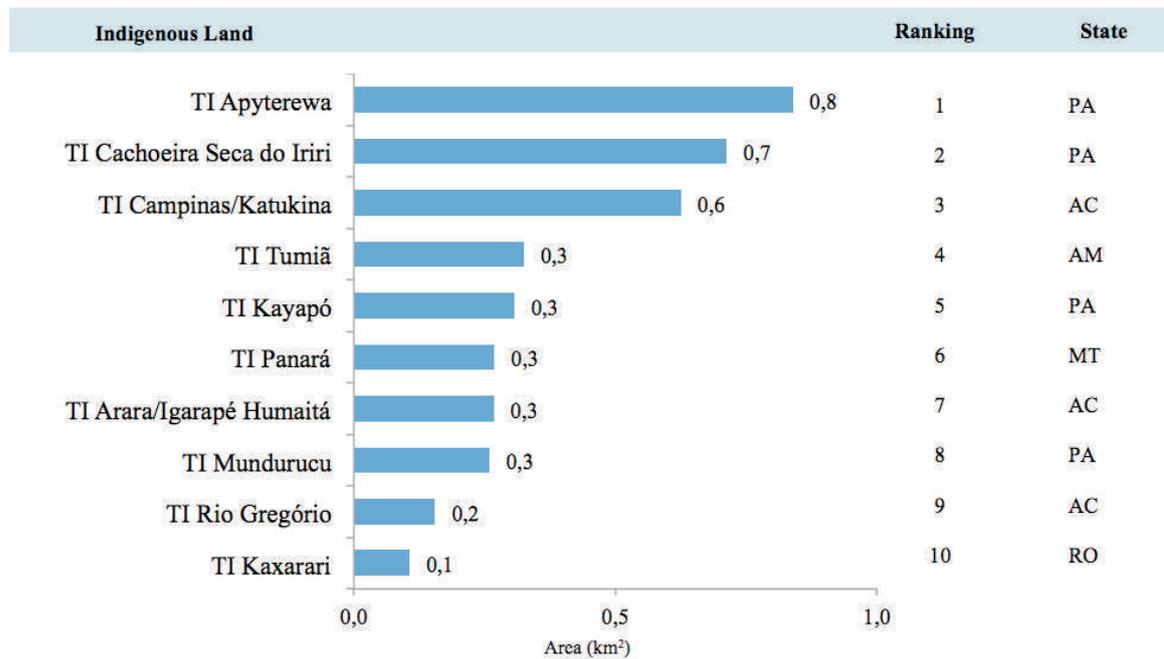


Figure 7. Indigenous Lands deforested in the Brazilian Amazon in July 2014 (Source: Imazon/SAD).

Critical Municipalities

In July 2014, the most deforested municipalities were Altamira (Pará) and São Félix do Xingu (Pará) (Figure 8 and 9).

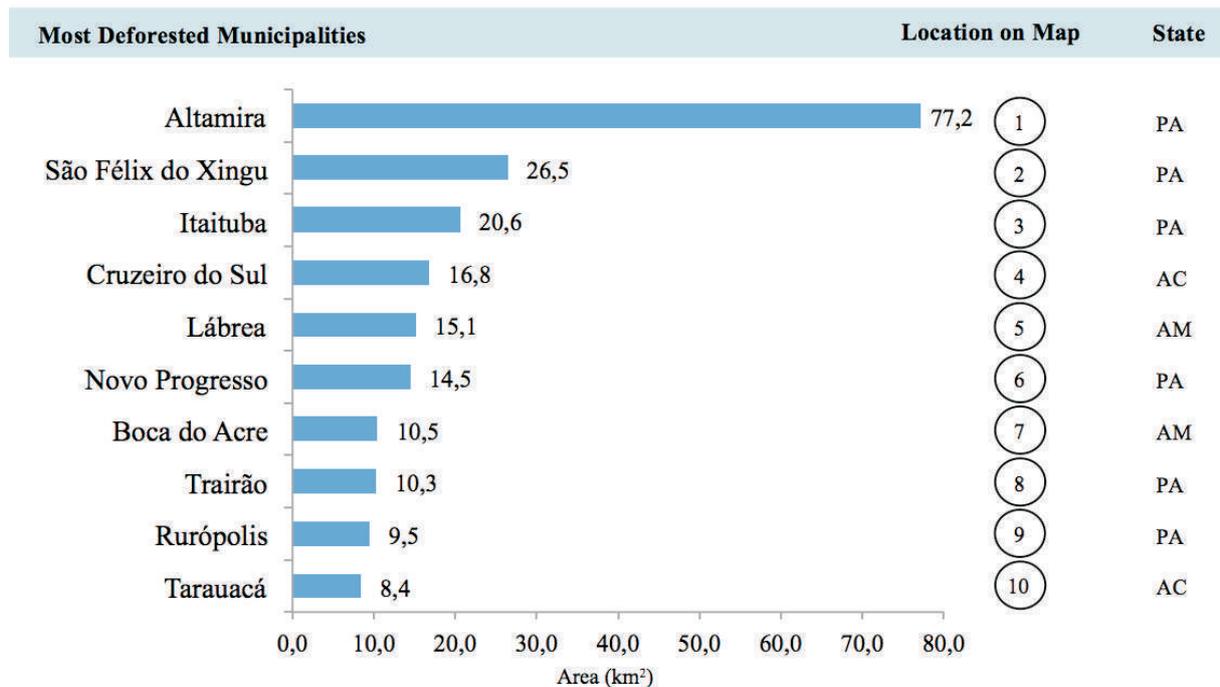


Figure 8. Most deforested Municipalities in the Brazilian Amazon in July 2014 (Source: Imazon /SAD).

Forest Transparency

Brazilian Amazon

July 2014

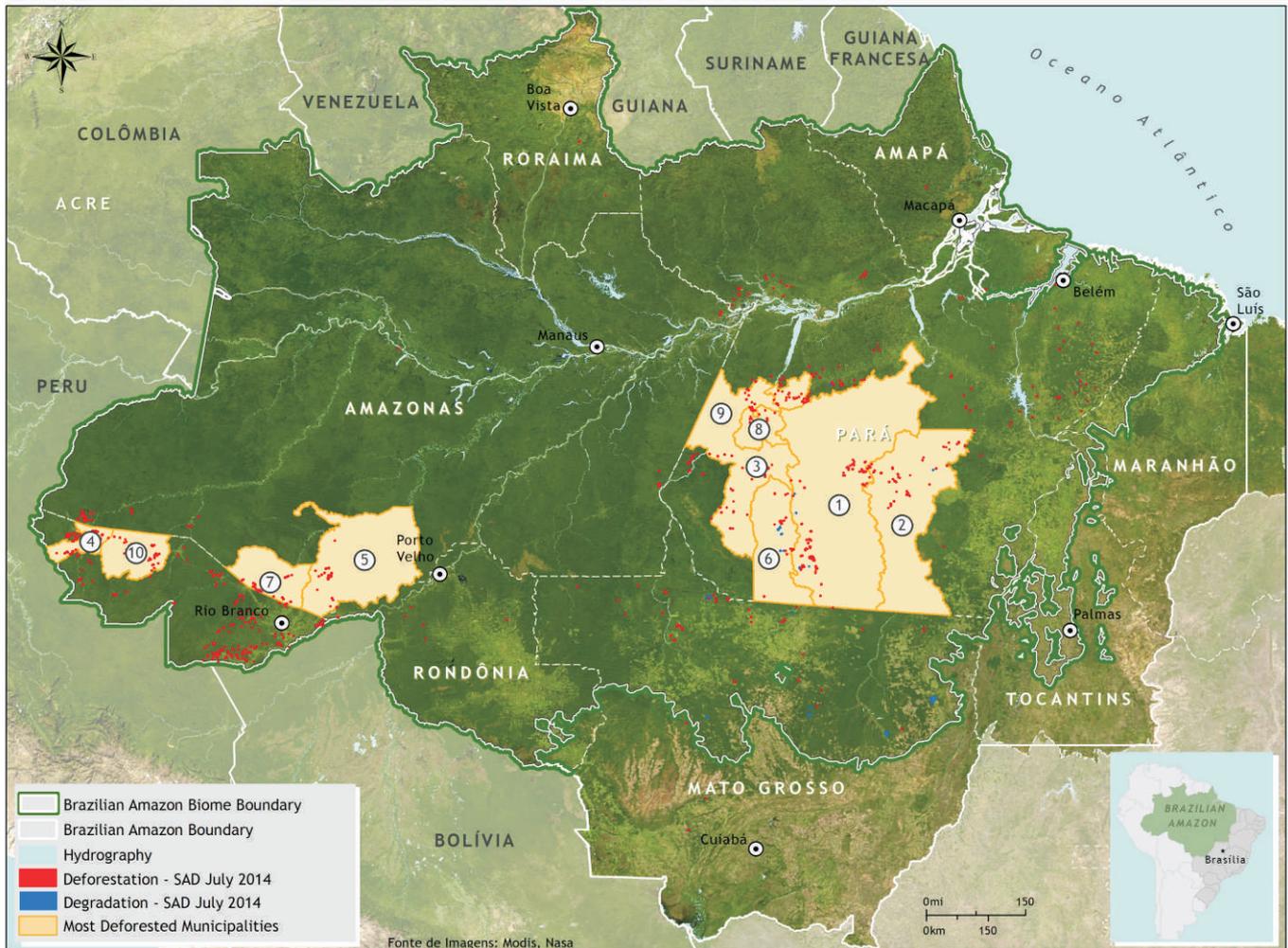


Figure 9. Municipalities with the largest areas deforested in July 2014 (Source: Imazon/SAD).

Cloud and Shadow Coverage

In July 2013, it was possible with SAD to monitor 90% of the forest area in the Brazilian Amazon, as opposed to 92% in July 2013. The other 10% of forest territory were covered by clouds, which made it difficult to detect deforestation and

forest degradation. The States with the highest cloud cover were Amapá (48%), Roraima (23%) and Pará (13%). Because of that, the data on deforestation and forest degradation for June 2014 may be underestimated (Figure 10).

* The part of Maranhão integrating the Brazilian Amazon was not analyzed.

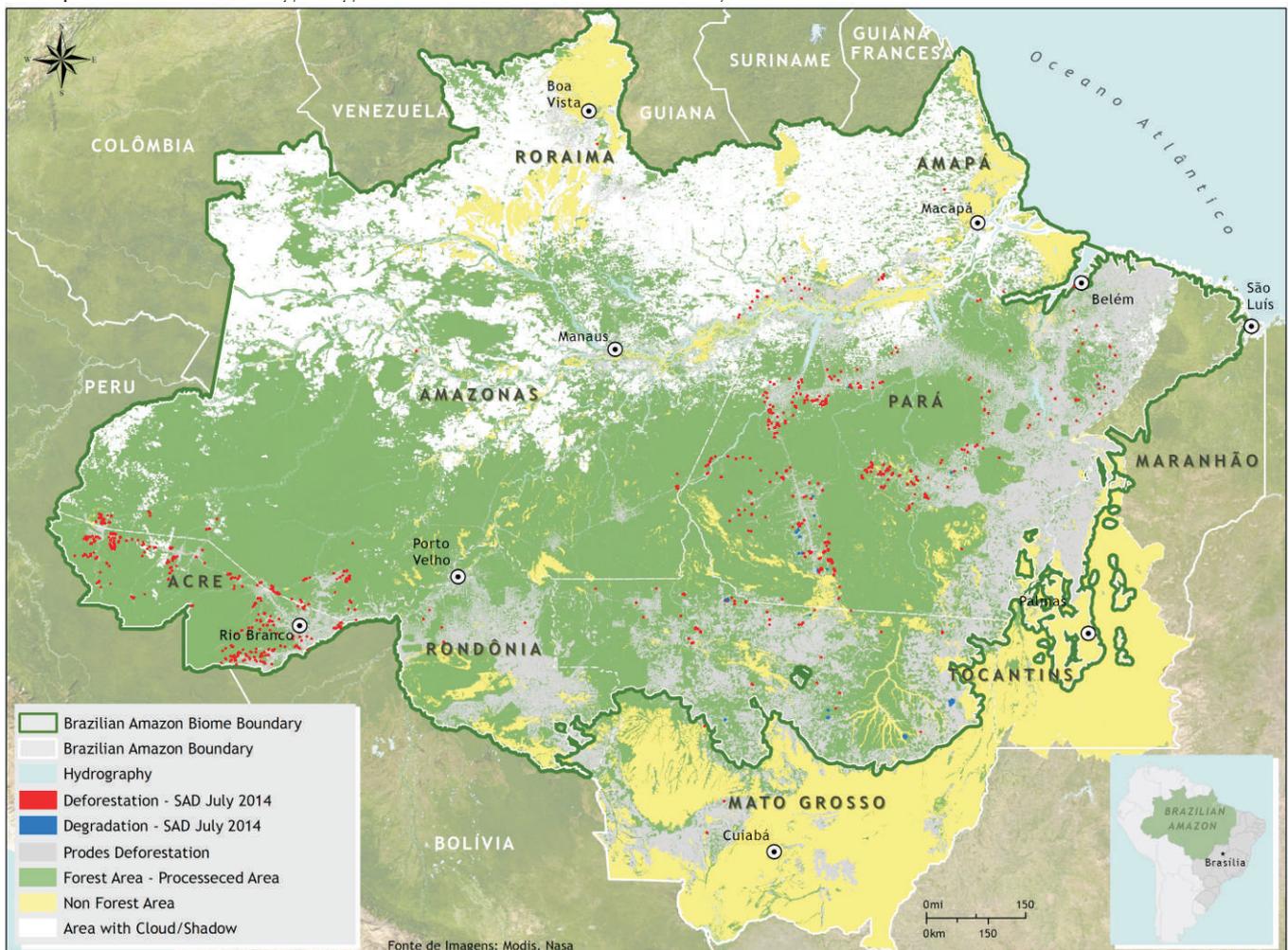


Figure 10. Area with cloud and shadow in July 2014 in the Brazilian Amazon.

SAD-EE

Since July 2012 deforestation and forest degradation detection alerts have been performed using the Google Earth Engine platform (EE), with the new SAD EE version. That system was developed in

collaboration with Google and uses the same process already employed by SAD 3.0 (Box I), with reflectance images from MODIS to generate the deforestation and forest degradation alerts.

Table I: SAD 3.0

Since October 2009, SAD has had some new features. First, we created a graphic interface to integrate all of the image processing programs used in SAD. Next, we began to compute deforestation in areas that were covered by clouds in the previous months in a new class. Finally, deforestation and degradation are detected with pairs of NDFI images using a change detection algorithm. The principal method continues to be the same as with SAD 2.0 as described below.

SAD generates a temporal mosaic of daily MODIS images from the MOD09GQ and MOD09GA products for filtering clouds. Next, we use a technique for fusing different spectral resolution bands, i.e. with pixels of different sizes. In this case, we made a change in scale from 5 bands with 500 meter pixels in MODIS to 250 meters. That allowed us to improve the spectral mixture model and provided the capacity for estimating the abundance of Vegetation, Soils and Non-Photosynthetic Vegetation (NPV) components (Vegetation, Soil and Shadow) to calculate the NDFI, with the following equation:

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

Where VGs is the Vegetation component normalized for shadow given by:

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

The NDFI varies from -1 (pixel with 100% of exposed soil) to 1 (pixel with > 90% of forest vegetation). Thus, we have a continuous image that shows the transition from deforested areas, going through degraded forests, until reaching forest without signs of disturbances.

Detection of deforestation and degradation this month involved a difference in the NDFI images from consecutive months. Thus, a reduction in the NDFI values of from -200 to -50 indicates possible deforested areas and from -49 to -20 indicates signs of degradation.

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

SAD has been in operation in the State of Mato Grosso since October 2006 and in the Brazilian Amazon since April 2008. In this bulletin, we present the monthly data generated by SAD from August 2012 to July 2014.

Team Responsible

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Team

João Siqueira, Marcelo Justino and Wildson Queiroz (Image interpretation), Kátia Pereira and Victor Lins (ImazonGeo), and Bruno Oliveira (Communication)

Data Source

Statistics for deforestation are generated using data from SAD (Imazon);
Data from INPE - Deforestation (PRODES)
[Http://www.obt.inpe.br/prodes/](http://www.obt.inpe.br/prodes/)

Acknowledgement:

Google Earth Engine Team
<http://earthengine.google.org/>

Partnerships:

Secretaria de Estado de Meio Ambiente do Pará (SEMA) (Environment Protection Agency of Pará)
Secretaria de Meio Ambiente do Mato Grosso (SEMA) (Environment Protection Agency of Mato Grosso)
Secretaria de Meio Ambiente do Pará (SEMA) (Environment Protection Agency of Pará)
Federal Public Prosecutor of Pará
State Public Prosecutor of Pará
State Public Prosecutor of Roraima
State Public Prosecutor of Amapá
State Public Prosecutor of Mato Grosso
Instituto Centro de Vida (ICV- Mato Grosso)

Support

