

Summary

SAD detected 402 square kilometers of deforestation in the Brazilian Amazon in September 2014. That represented an increase of 290% in relation to September 2013 when deforestation totaled 103 square kilometers. It was possible to monitor 93% of the forest area in the Brazilian Amazon while in September 2013 monitoring covered a smaller area (79%) of the territory.

In September 2014, deforestation was concentrated in Rondônia (33%), Pará (23%), followed by Mato Grosso (18%) and Amazonas (12%), with a lower occurrence in Acre (10%), Roraima (4%) and Tocantins (1%).

Degraded forests in the Brazilian Amazon totaled 624 square kilometers in September 2014. In relation to September 2013, when forest degradation totaled 16 square kilometers, there was an increase of 3.797%.

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Deforestation statistics

According to SAD, deforestation (total suppression of the forests for other alternative land uses) reached 402 square kilometers in September 2014 (Figure 1 and Figure 2).

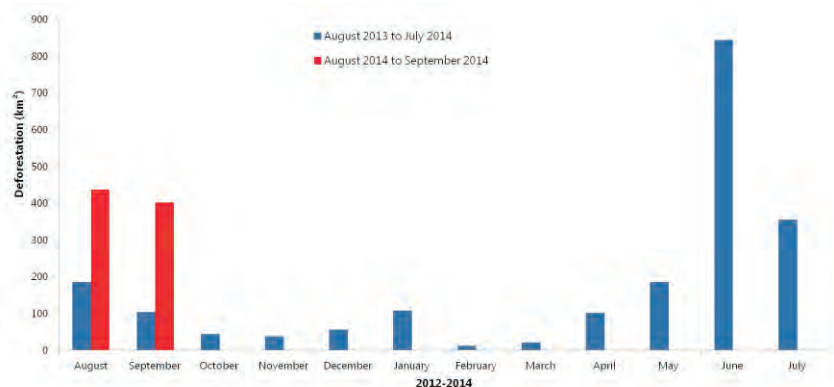


Figure 1. Deforestation from August 2013 to September 2014 in the Brazilian Amazon (Source: Imazon/SAD).

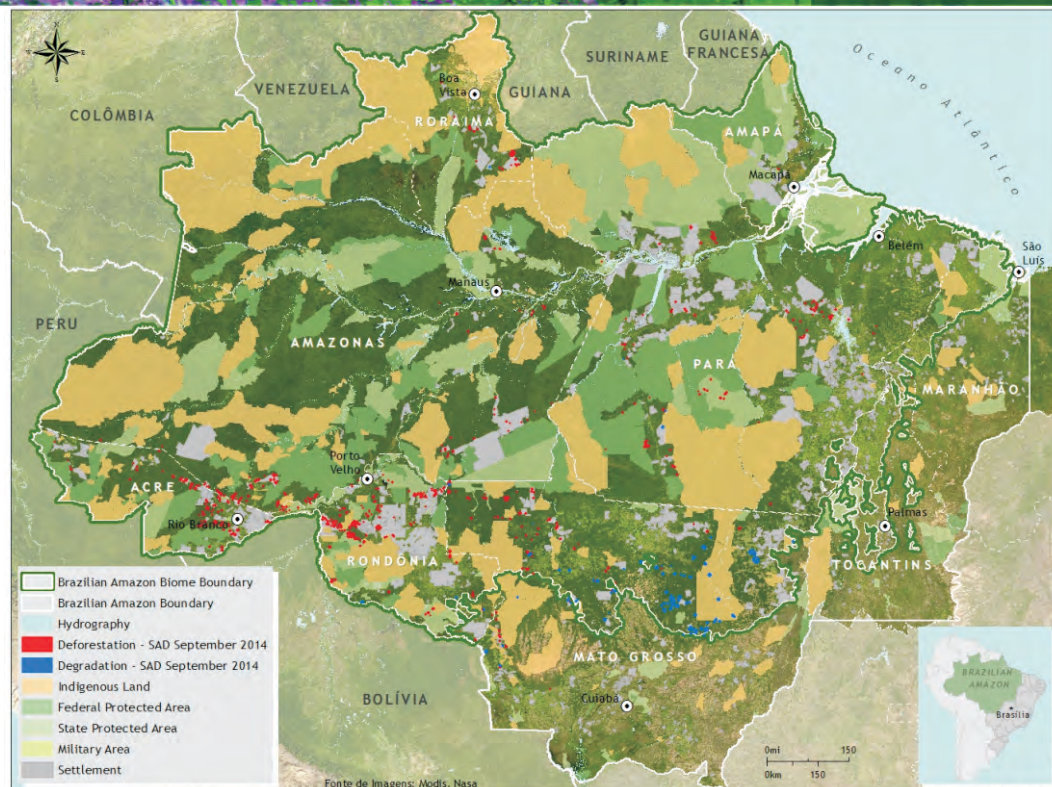


Figure 2. Deforestation and forest degradation in September 2014 in the Brazilian Amazon (Source: Imazon/ SAD).

In September 2014, deforestation was concentrated in Rondônia (33%), Pará (23%), followed by Mato Grosso (18%) and Amazonas (12%), with a lower occurrence in Acre (10%), Roraima (4%) and Tocantins (1%) (Figure 3).

Deforestation accumulated during the period of August to September 2014, corresponding to the first two months of the official calendar for measuring deforestation, reached 838 square kilometers. There was a 191% increase in deforestation in relation to the previous period (August 2013 to September 2013) when reached 288 square kilometers.

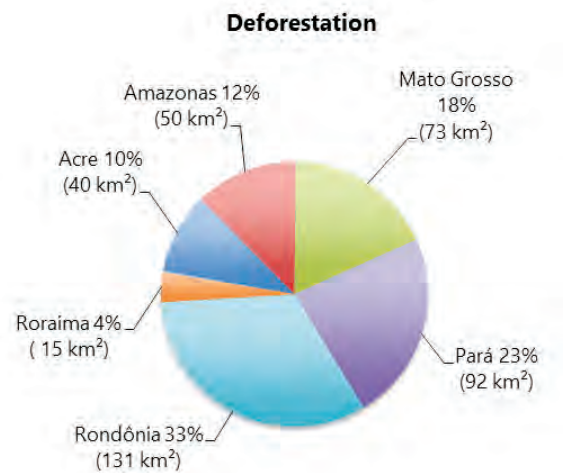


Figure 3. Percentage of deforestation in States of the Brazilian Amazon in September 2014 (Source: Imazon/SAD).

Considering the first two months of the current deforestation calendar (August 2014 to September 2014), Rondônia leads the ranking with 31% of the total deforested during the period. Next come Mato Grosso (26%) and Pará (18%). In relative terms, there was a significant increase of 2.699% in Roraima and 939% in Mato Grosso.

In absolute terms, Rondônia leads the ranking of accumulated deforestation with 260 square kilometers, followed by Mato Grosso (222 square kilometers) and Pará (152 square kilometers) (Table 1).

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

State	August to September 2013	August to September 2014	Variation (%)
Pará	84	152	+81
Mato Grosso	21	222	+957
Rondônia	88	260	+195
Amazonas	75	132	+76
Roraima	1	20	+1.900
Acre	19	51	+168
Tocantins	-	1	-
Amapá	-	-	-
Total	288	838	+191

* Data from Maranhão were not analyzed.

Forest degradation

In September 2014, SAD recorded 624 square kilometers of degraded forests (forests intensely exploited by logging activity and/or burned) (Figures 2 and 4). Of that total, the great majority (97%) occurred in Mato Grosso, followed by Rondônia (2%) and Pará (1%).

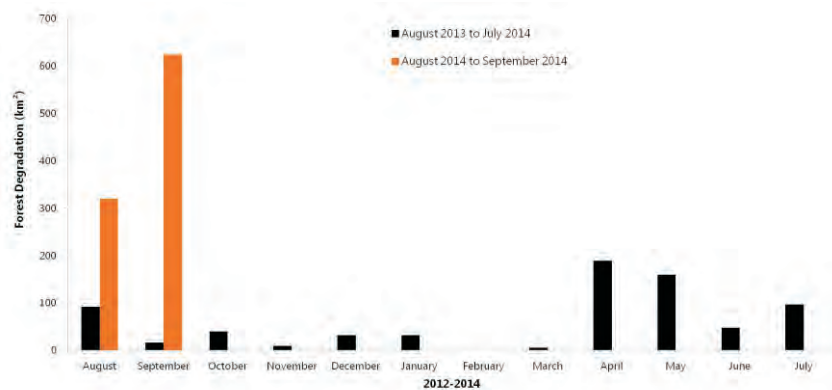


Figure 4. Forest degradation from August 2013 to September 2014 in the Brazilian Amazon (Source: Imazon/SAD).

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

State	August to September 2013	August to September 2014	Variation (%)
Mato Grosso	59	650	+1.002
Pará	47	48	+2
Rondônia	-	12	-
Amazonas	2	1	-50
Roraima	-	-	-
Acre	-	-	-
Tocantins	-	-	-
Amapá	-	-	-
Total	108	711	+558

* Data from Maranhão were not analyzed.

Geography of deforestation

In September 2014, the majority (59%) of deforestation occurred in areas that were private or under different stages of possession. The remaining deforestation was recorded in Land Reform Settlements (20%), Conservation Units (19%) and Indigenous Lands (2%) (Table 3).

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

Category	September 2014	
	km ²	%
Land Reform Settlement	82	20
Conservation Units	73	19
Indigenous Lands	8	2
Private, Possession & Untitled Public Lands	239	59
Total (km²)	402	100

Land Reform Settlements

SAD recorded 82 square kilometers of deforestation in the Land Reform Settlements in September 2014 (Figure 5). The Settlements most affected by deforestation were PAE Antimary (Boca do Acre; Amazonas), PA Monte (Boca do Acre; Amazonas) and PA Igarapé Azul (Nova Mamoré; Rondônia).



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

Protected Areas

During the month of September 2014, SAD detected 73 square kilometers of deforestation in Conservation Units (Figure 6). In the case of Indigenous Lands, in September 2014 8 square kilometers of deforestation were detected (Figure 7).

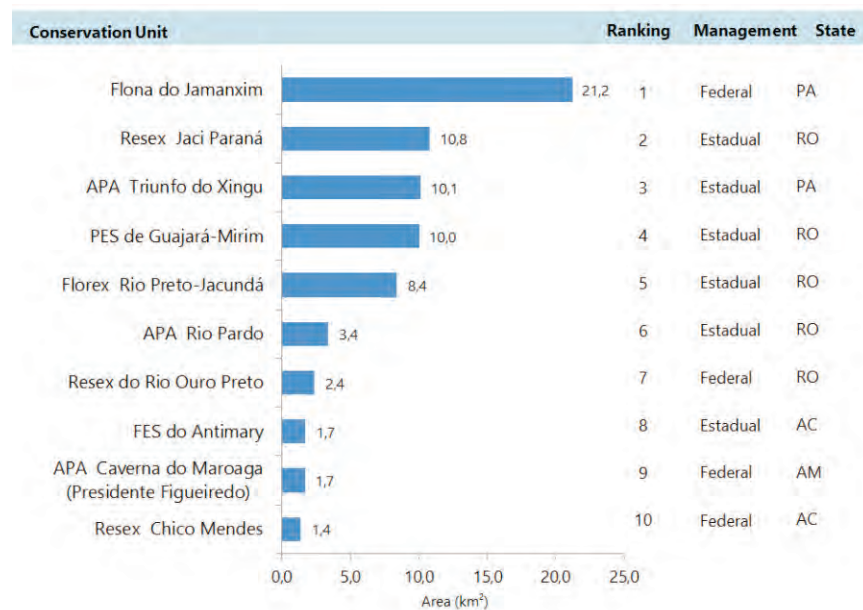


Figure 6. Conservation Units deforested in the Brazilian Amazon in September 2014 (Source: Imazon /SAD).

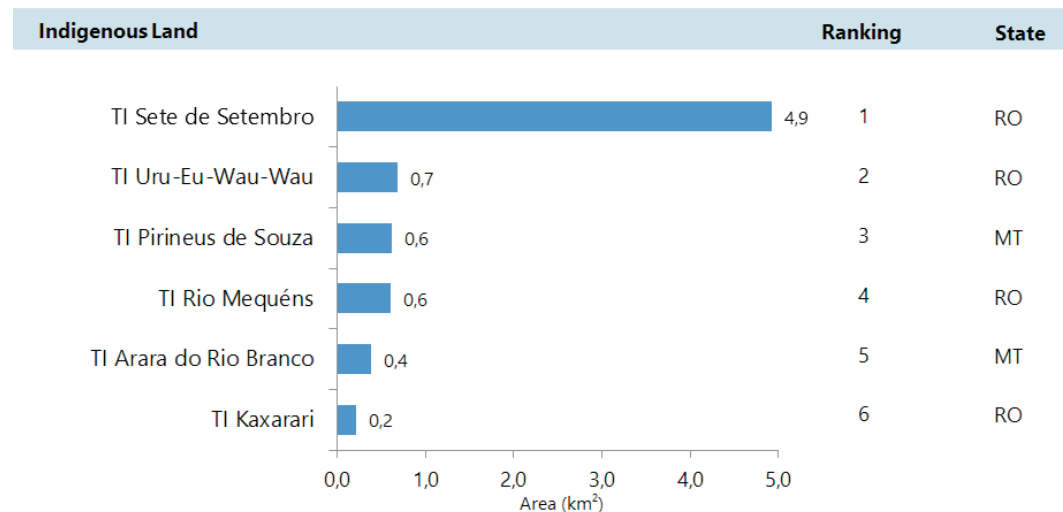


Figure 7. Indigenous Lands deforested in the Brazilian Amazon in September 2014 (Source: Imazon /SAD).

Critical municipalities

In September 2014, the most deforested municipalities were: Nova Mamoré (Rondônia) and Novo Progresso (Pará) (Figure 8 and 9).

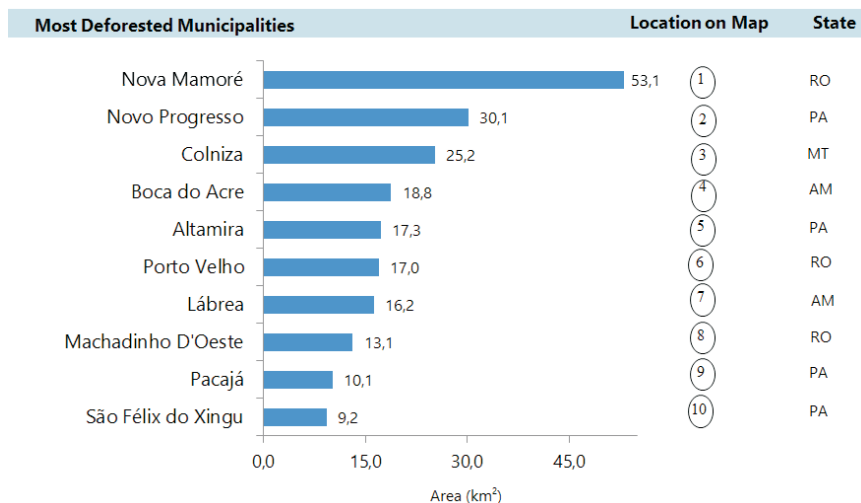


Figure 8. Most deforested municipalities in the Brazilian Amazon in September 2014 (Source: Imazon /SAD).

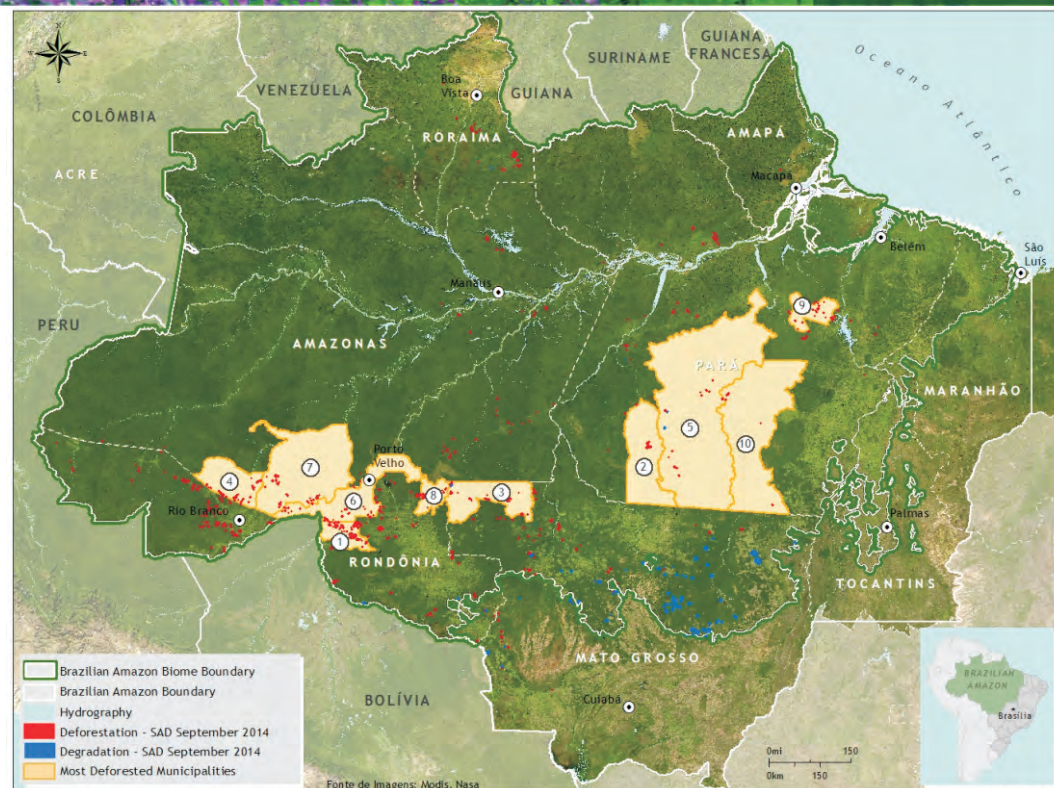


Figure 9. Municipalities with the largest areas deforested in September 2014 (Source: Imazon/SAD).

Cloud and shadow cover

In September 2014, it was possible with SAD to monitor 93% of the forest area in the Brazilian Amazon. The other 7% of forest territory was covered by clouds, which made it difficult to detect deforestation and forest degradation. The States with the highest cloud cover were Pará (21%) and Amapá (18%). Because of that, the data on deforestation and forest degradation for September 2014 may be underestimated (Figure 10).

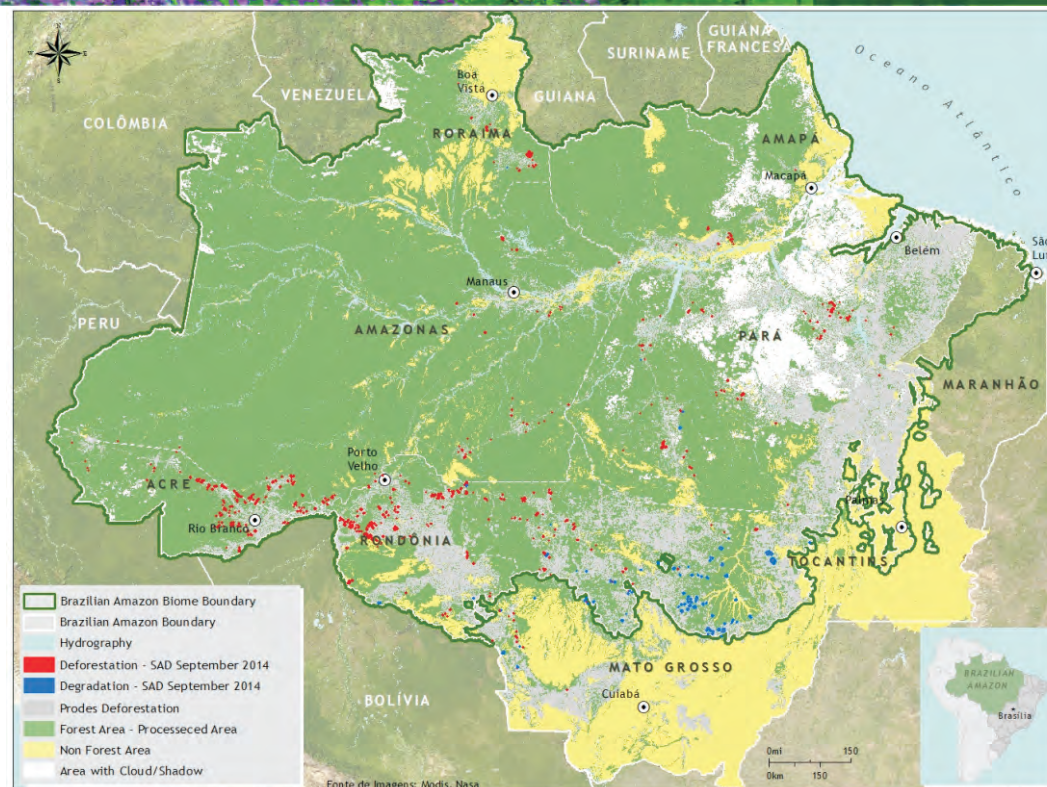


Figure 10. Area with cloud and shadow in September 2014 in the Brazilian Amazon.

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.

* The portion of Maranhão that is part of the Brazilian Amazon was not analyzed.

BOX I: SAD 3.0

Since August 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 August 2006 and in the Legal Amazon since August 2008. In this bulletin, we present the monthly data generated by SAD from August 2013 to September 2014.

Team reasponsible

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Data source

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

Acknowledgements

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

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Support

