Summary

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SAD detected 244 square kilometers of deforestation in the Brazilian Amazon in October 2014. That represented a 467% increase in relation to October 2013 when deforestation totaled 43 square kilometers. It was possible to monitor 72% of the forest area in the Brazilian Amazon while in October 2013 the monitoring covered a smaller area (69%) of the territory.

In October 2014, the deforestation was concentrated in Rondônia (27%), Mato Grosso (23%), followed by Pará (22%) and Amazonas (13%), with lower occurrence in Roraima (9%), Acre (5%) and Amapá (1%).

Degraded forests in the Brazilian Amazon totaled 468 square kilometers in October 2014. In relation to October 2013, when forest degradation totaled 40 square kilometers there was a 1,070% increase.

Deforestation statistics

According to SAD, deforestation (total suppression of the forest for other alternative land uses) reached 244 square kilometers in October 2014 (Figure 1 and Figure 2).
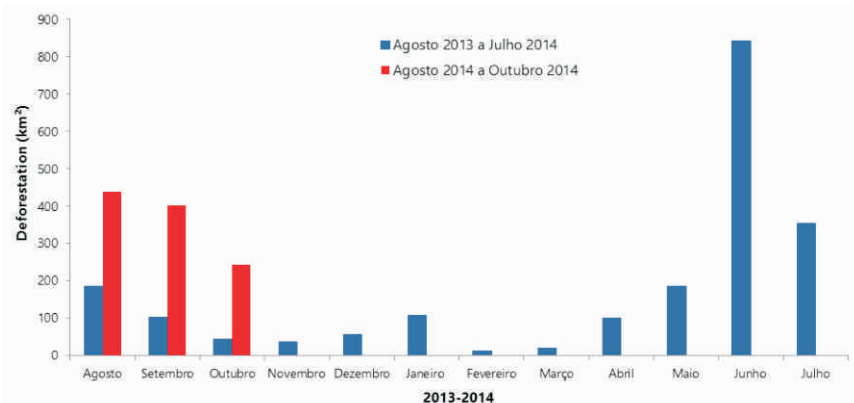

Figure 1. Deforestation from August 2013 to October 2014 in the Brazilian Amazon (Source: Imazon/SAD).
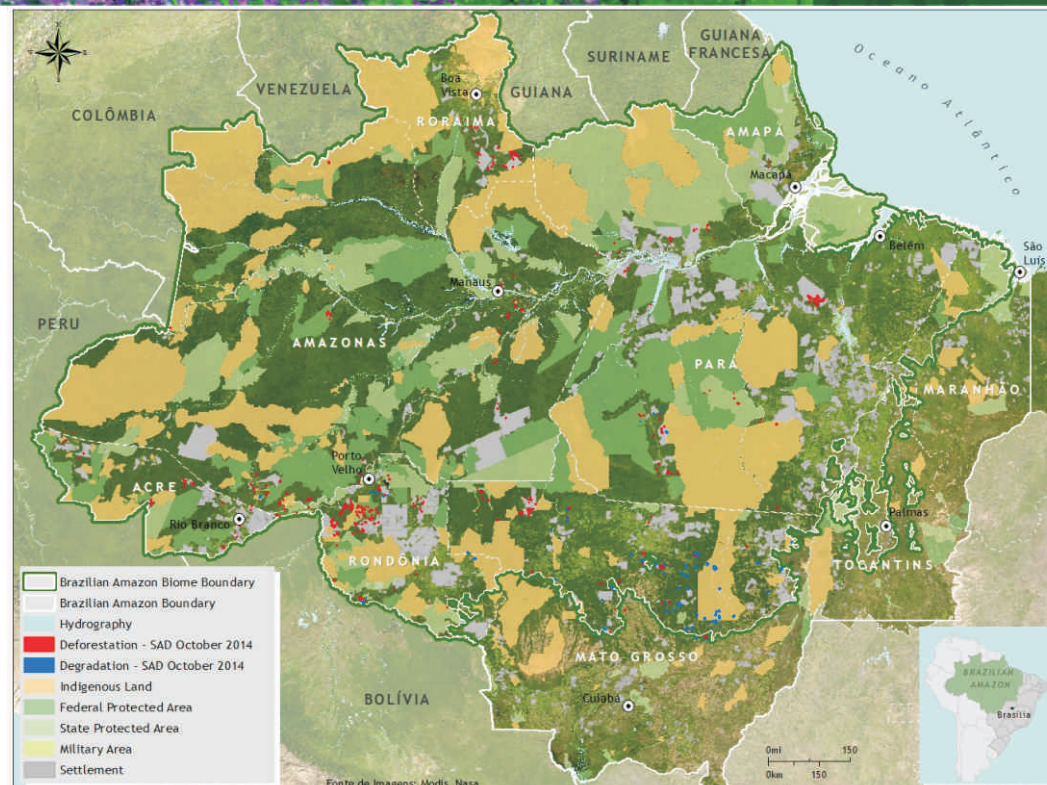

Figure 2. Deforestation and forest degradation in October 2014 in the Brazilian Amazon (Source: Imazon/ SAD).

In October 2014, the deforestation was concentrated in Rondônia (27%), Mato Grosso (23%), followed by Pará (22%) and Amazonas (13%), with lower occurrence in Roraima (9%), Acre (5%) and Amapá (1%) (Figure 3).

Deforestation accumulated during the period of August to October 2014, corresponding to the first three months of the official calendar for measuring deforestation, reached 1,082 square kilometers. There was a 226% increase in deforestation in relation to the previous period (August 2013 to October 2013) when it reached 332 square kilometers.
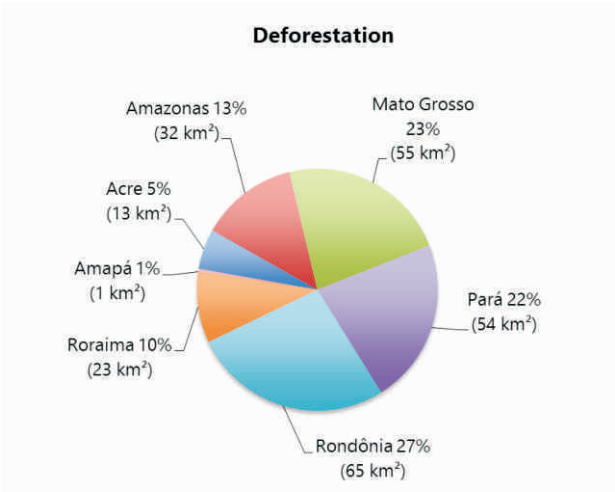
Considering the first three months of the current deforestation calendar (August 2014 to October 2014), Rondônia leads the ranking with 30% of the total deforested during the period. Next come Mato Grosso (26%) and Pará (19%). In relative terms, there was a significant increase of 4,200% in Roraima and 889% in Mato Grosso.

In absolute terms, Rondônia leads the ranking of accumulated deforestation with 326 square kilometers, followed by Mato Grosso (277 square kilometers) and Pará (206 square kilometers) (Table 1).

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

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

State	August to October 2013	August to October 2014	Variation (%)
Pará	89	206	+132
Mato Grosso	28	277	+889
Rondônia	99	326	+229
Amazonas	92	164	+78
Roraima	1	43	+4,200
Acre	23	65	+182
Tocantins	-	1	-
Amapá	-	-	-
Total	**332**	**1,082**	**+226**

* Data from Maranhão were not analyzed.

Forest degradation

In October 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 (90%) occurred in Mato Grosso, followed by Rondônia (5%), Pará (3%) and Amazonas (2%).
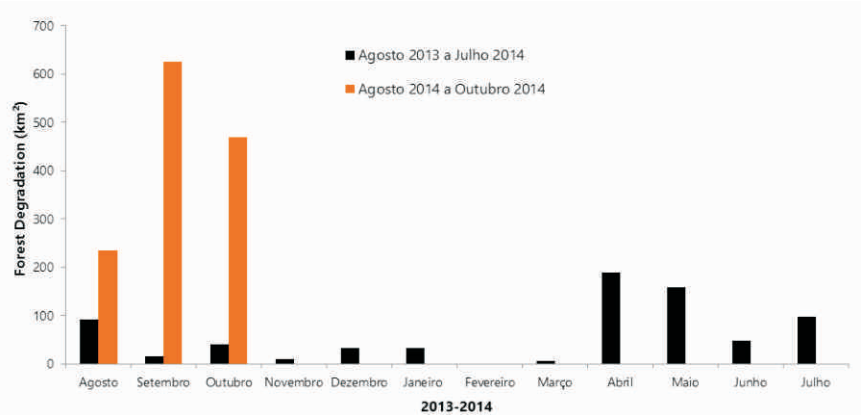

Figure 4. Forest Degradation from August 2013 to October 2014 in the Brazilian Amazon (Source: Imazon/SAD).

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

State	August to October 2013	August to October 2014	Variation (%)
Mato Grosso	94	1,073	+1,004
Pará	47	64	+2
Rondônia	6	35	–
Amazonas	2	7	-58
Roraima	–	–	–
Acre	–	–	–
Tocantins	–	–	–
Amapá	–	–	–
Total	**149**	**1,179**	**+691**

* 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 October 2014 in the Brazilian Amazon (Source: Imazon/ SAD).

Category	October 2014	
	km²	%
Land Reform Settlements	55	22
Conservation Units	39	16
Indigenous Lands	5	2
Private, Possession & Untitled Public Lands	145	60
Total (km²)	244	100

Land Reform Settlements

SAD recorded 55 square kilometers of deforestation in the Land Reform Settlements in October 2014 (Figure 5). The Settlements most affected by deforestation were PDS Liberdade (Pacajá; Pará), PDS Terra Nossa (Altamira; Pará) and PAE Novo Jardim (Autazes; Amazonas).
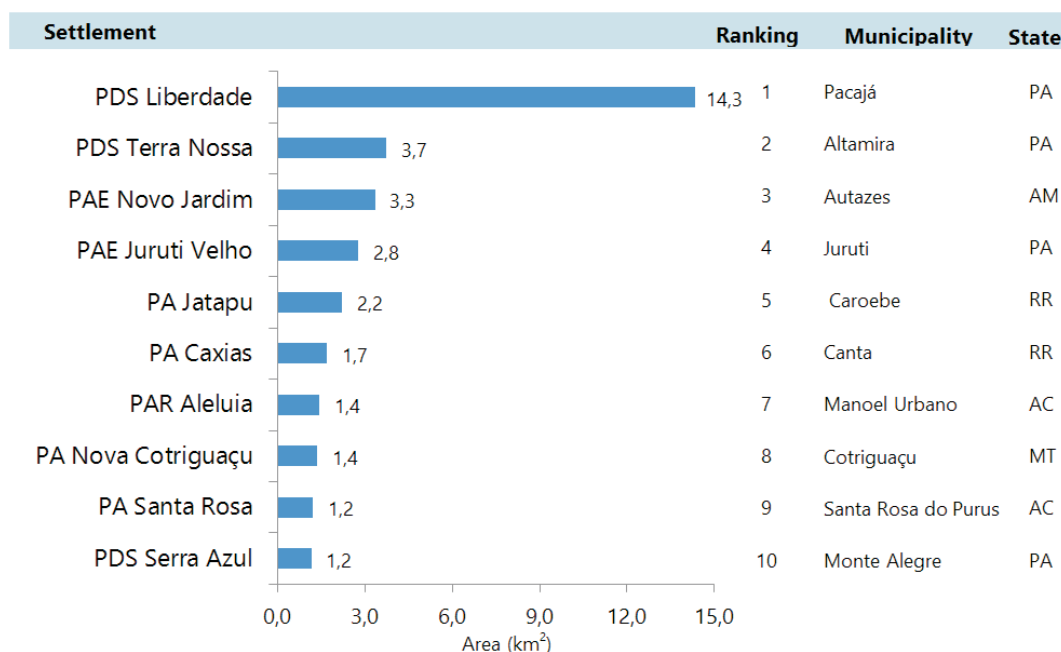

Settlement	Area (km²)	Ranking	Municipality	State
PDS Liberdade	14,3	1	Pacajá	PA
PDS Terra Nossa	3,7	2	Altamira	PA
PAE Novo Jardim	3,3	3	Autazes	AM
PAE Juruti Velho	2,8	4	Juruti	PA
PA Jatapu	2,2	5	Caroebe	RR
PA Caxias	1,7	6	Canta	RR
PAR Aleluia	1,4	7	Manoel Urbano	AC
PA Nova Cotriguaçu	1,4	8	Cotriguaçu	MT
PA Santa Rosa	1,2	9	Santa Rosa do Purus	AC
PDS Serra Azul	1,2	10	Monte Alegre	PA

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

Protected Areas

In the month of October 2014, SAD detected 39 square kilometers of deforestation in the Conservation Units (Figure 6). In the case of Indigenous Lands, in October 2014 5 square kilometers of deforestation were detected in TI Yanomami (Amazonas) and TI Kayapó (Pará).
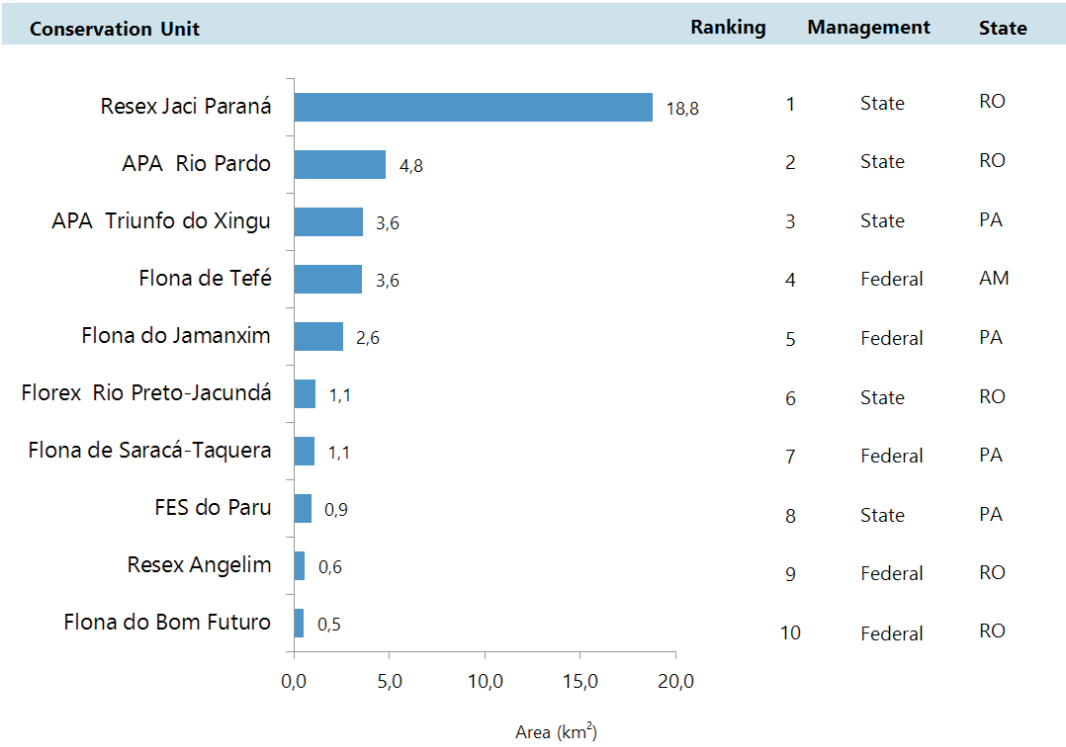
Conservation Unit	Area (km²)	Ranking	Management	State
Resex Jaci Paraná	18,8	1	State	RO
APA Rio Pardo	4,8	2	State	RO
APA Triunfo do Xingu	3,6	3	State	PA
Flona de Tefé	3,6	4	Federal	AM
Flona do Jamanxim	2,6	5	Federal	PA
Florex Rio Preto-Jacundá	1,1	6	State	RO
Flona de Saracá-Taquera	1,1	7	Federal	PA
FES do Paru	0,9	8	State	PA
Resex Angelim	0,6	9	Federal	RO
Flona do Bom Futuro	0,5	10	Federal	RO

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

Critical municipalities

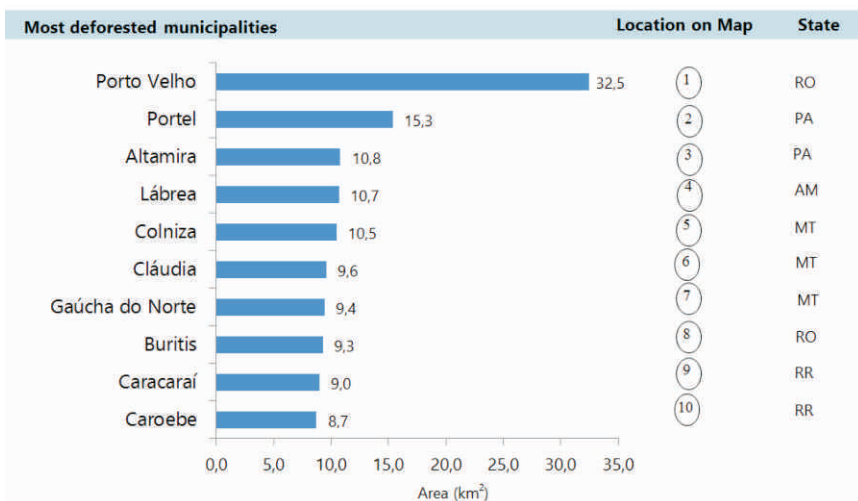In October 2014, the most deforested municipalities were: Porto Velho (Rondônia) and Portel (Pará) (Figure 7 and 8).

Most deforested municipalities		Location on Map	State
Porto Velho	32,5	1	RO
Portel	15,3	2	PA
Altamira	10,8	3	PA
Lábrea	10,7	4	AM
Colniza	10,5	5	MT
Cláudia	9,6	6	MT
Gaúcha do Norte	9,4	7	MT
Buritis	9,3	8	RO
Caracaraí	9,0	9	RR
Caroebe	8,7	10	RR

Figure 7. Most deforested municipalities in the Brazilian Amazon in October 2014 (Source: Imazon /SAD).
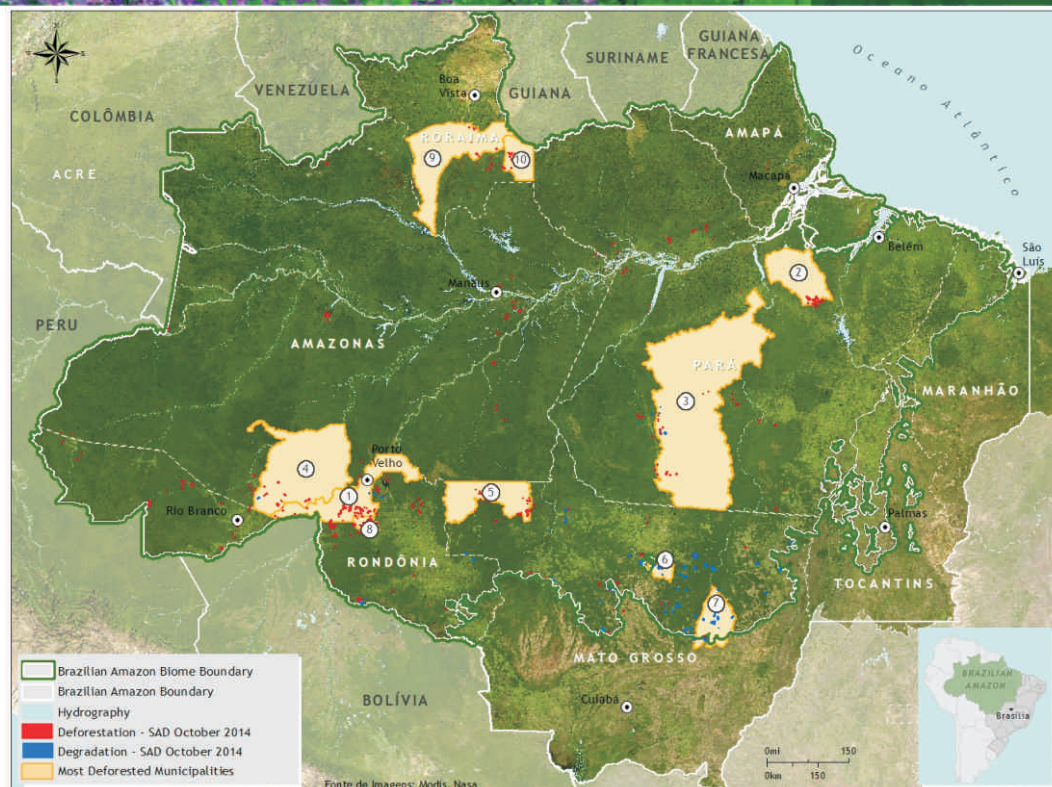

Figure 8. Municipalities with the largest areas deforested in October 2014 (Source: Imazon/SAD).

Cloud and shadow cover

In October 2014, it was possible with SAD to monitor 72% of the forest area in the Brazilian Amazon. The other 28% 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 (44%) and Amapá (38%). Because of that, the data on deforestation and forest degradation for October 2014 may be underestimated (Figure 9).
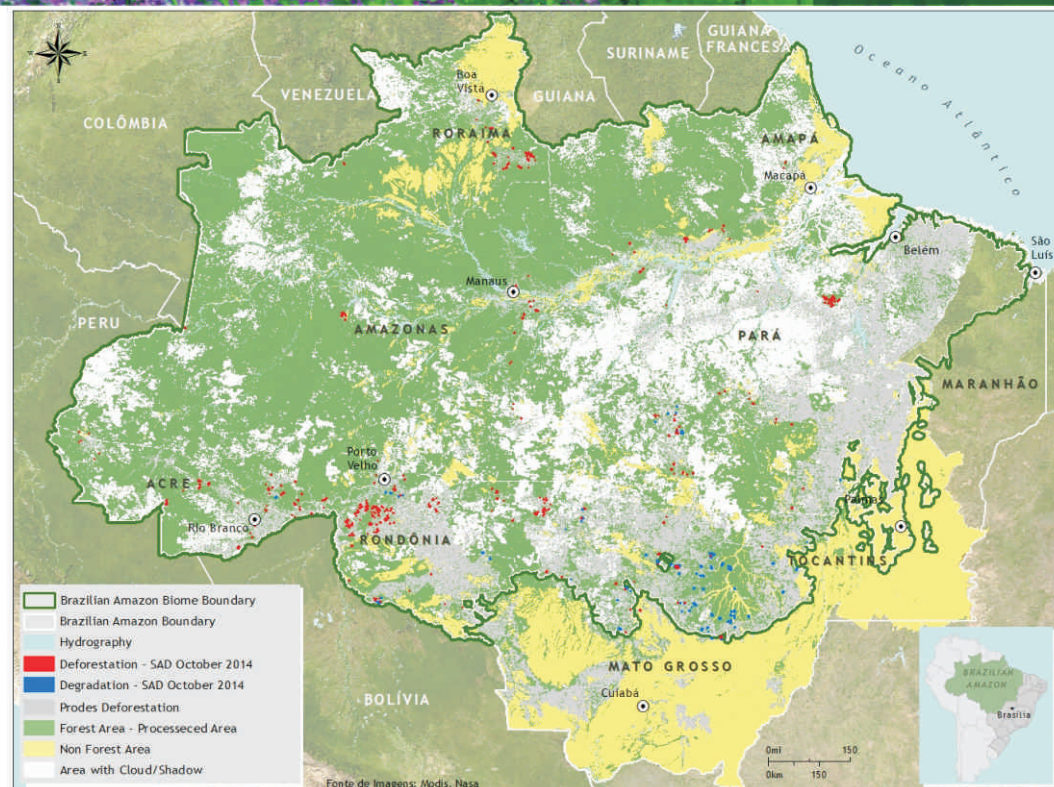
SAD-EE

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.

Figure 9. Area with cloud and shadow in October 2014 in the Brazilian Amazon.

* 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:

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

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

$$Vgs = Vegetation/ (1- Shadow)$$

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 October 2014.

Imazon

Team reasponsible

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Team: João Siqueira e Marcelo Justino (Image interpretation),
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Data source

Statistics for deforestation are generated using data from SAD (Imazon);
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http://www.obt.inpe.br/prodes/

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

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Support

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