

Boundary Extent Change, Peat Moratorium Encroachment and Fire Location Analysis of Palm Oil Concessions in Central Kalimantan Province, Indonesia

Aimee Teaby

John Urness

11/21/2015

Executive Summary

Peat bogs are a globally significant repository for carbon. When drained, burned, and cleared they are a source of atmospheric carbon. Under a presidential decree and an international agreement with Norway, peatlands in Indonesia are legally protected through the implementation of a geographically defined moratorium. The national moratorium map is revised every six months, leading to frequent changes in boundaries of the areas protected from plantation development.

The study analyzed the interplay and quantitative change in and between boundaries for palm oil concessions, peat moratorium areas, and the Tanjung Puting National Park. Geospatial boundary data were provided by Friends of the Earth for this study and were used to assess changes in boundary extents over the course of several administrative revisions and the amount of overlap with palm oil concessions operated by ASMR, BGA, STP, KSI and RHS between the years of 2011 and 2015. Geospatial fire hotspot data between January and November of 2015 was acquired from NASA in order to assess timing of fires and concession burn permits.

The study showed that palm oil plantation operators have encroached on moratorium-protected peat lands or, in some cases, due to changing moratorium boundaries, have developed oil palm plantations on lands formerly protected under earlier revisions of the moratorium area. The areal extent of the peat moratorium within the province of Central Kalimantan was reduced from 4,531,349 to 3,669,893 hectares, a loss of 861,457 hectares or 19% in the area protected by the initial National Peat Moratorium (App. Fig. G, App. Table B). The study also showed that extensive fire activity occurred in the summer of 2015 within and directly adjacent to concession boundaries.

Further analysis using land cover classification algorithms could quantify the amount of deforestation that has occurred over time. Ongoing remote sensing analysis could be done at regular intervals to correlate land-cover change, burn scars, and correlation of hotspot activity with burn permits.

Data

GPS survey points, KMZ files of moratorium, national park and concession boundaries were provided by Friends of the Earth (FoE). Fire hotspots were acquired from the NASA Fire Information for Resource Management System. Base map imagery was provided by ESRI.

Study Area

The area of study for this analysis was in and around the BGA and ASMR palm oil concessions adjacent to the peat moratorium areas and Tanjung Puting National Park (TPNP) in Central Kalimantan Province, (Fig. 1) and STP, KSI and RHS concessions to the east of TPNP.

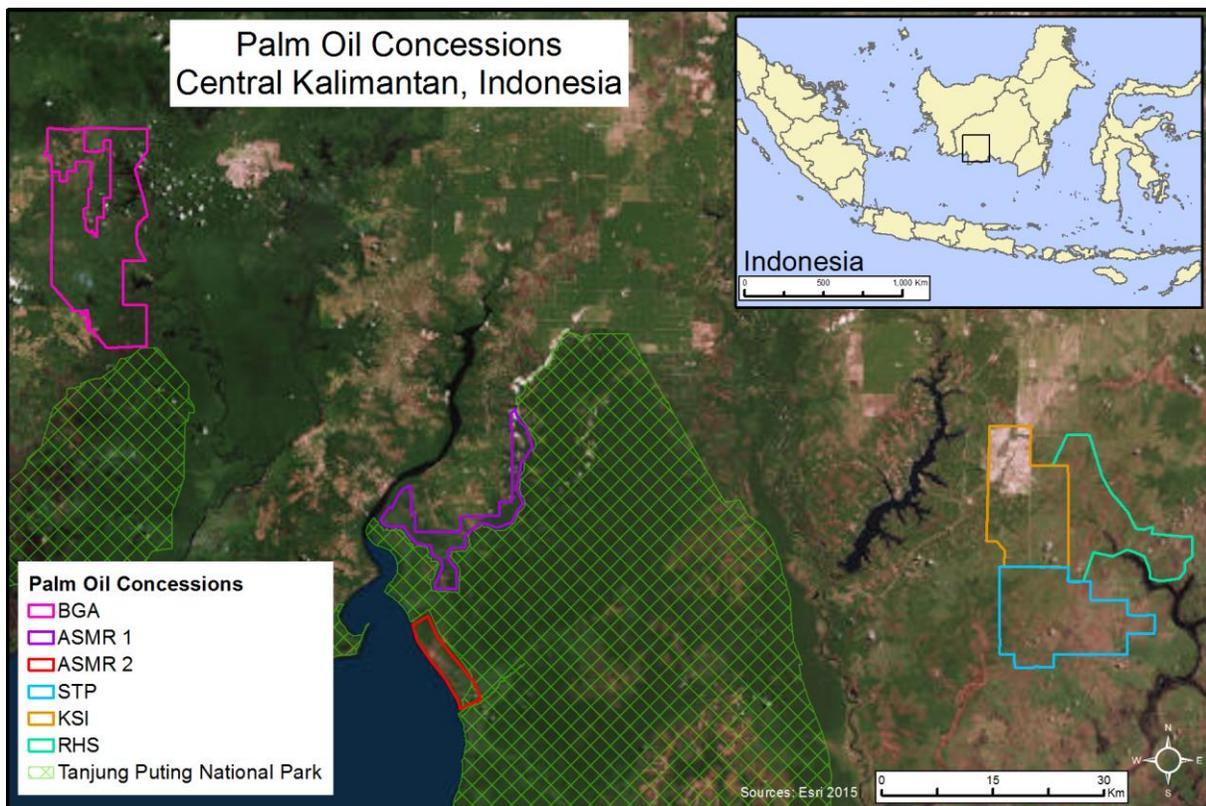


Figure 1. Palm oil concessions study area in Central Kalimantan, Indonesia.

See Appendix for additional study area maps and tables.

Figure 2 shows the entire current extent of the ASMR Concessions 1 and 2 and the boundary of the Tanjung Puting National Park (TPNP). The intersection of these two extents showed that overlap in the southern ASMR Concession (ASMR 2) was 412 hectares.

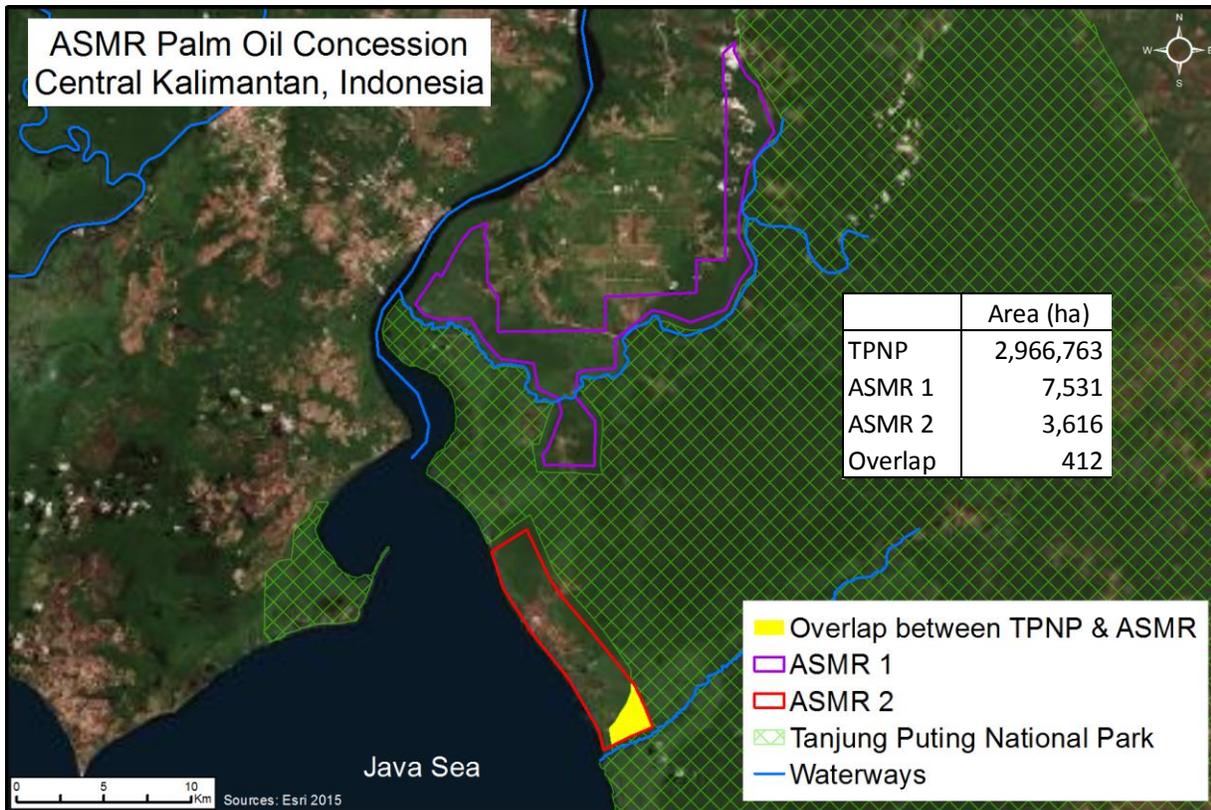


Figure 2. ASMR Palm Oil Concessions overlap with the Tanjung Puting National Park located in Central Kalimantan, Indonesia

Figures 3-6 show the areas of overlap between the ASMR Concession 1 and 2 and Moratoriums 2-5. Figure 3 illustrates the overlap between the ASMR Concession and Moratorium Revision 2 (implemented May 6, 2012). Moratorium Revision 1 and 2 exhibited the same number of overlapping hectares with the current ASMR Concession with 2,055 in Concession 1 and 1,112 in Concession 2 (Table 1). The percent overlap represents the proportion of overlap by the peat moratorium within each concession area. See Table 1 for all calculated hectares and percent of overlap between each moratorium revision and ASMR Concession.

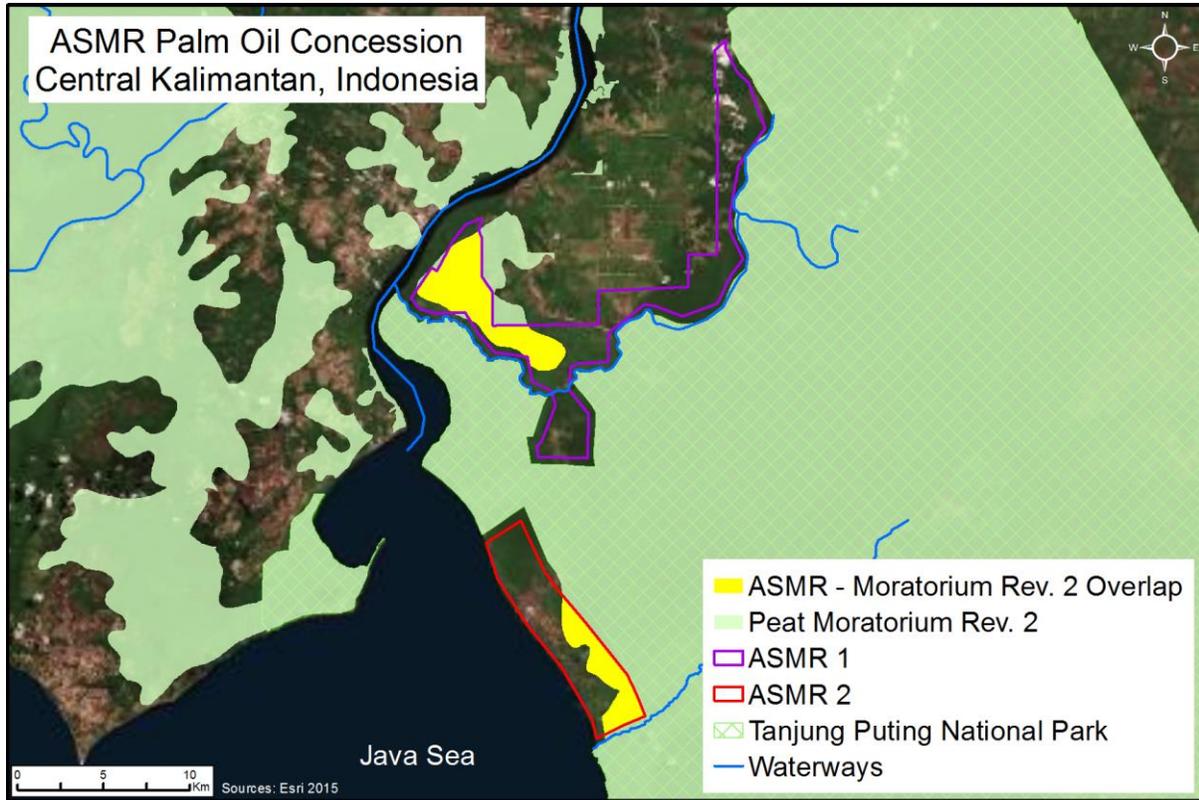


Figure 3. Peat Moratorium Revision 2 (implemented May 6, 2012) overlaps with both ASMR Concession 1 and 2.

Table 1. Total area for all revisions of the Peat Moratorium and the Tanjung Puting National Park (TPNP), along with the calculated hectares, percent of overlap between the AMSR Concession 1 and 2, and percent overlap change from the previous Moratorium. The total area represents the total area of each Moratorium within the Kalimantan Province.

Mor. Rev.	Total Area (ha)	Overlap (ha) Concession		Overlap (%) Concession		% Overlap Change Concession	
		1	2	1	2	1	2
Initial	4,531,350	2,075	1,302	28%	36%		
1	4,218,547	2,055	1,112	27%	31%	0%	-5%
2	4,139,045	2,055	1,112	27%	31%	0%	0%
3	1,038,301	2,055	701	27%	19%	0%	-11%
4	3,673,562	1,584	1,113	21%	31%	-6%	11%
5	3,786,283	129	556	2%	15%	-19%	-15%
6	3,696,980	129	527	2%	15%	0%	-1%
7	3,669,893	129	527	2%	15%	0%	0%

Table 2. Percent change for each AMSR Concession and the overall change exhibited from the initial Moratorium until present.

Mor. Rev.	Start Dates	% Change Overlap Concession	
		1	2
Initial	20-Jun-11	0	0
1	22-Nov-11	0%	-5%
2	6-May-12	0%	0%
3	19-Nov-12	0%	-11%
4	16-May-13	-6%	11%
5	13-Nov-13	-19%	-15%
6	28-Apr-14	0%	-1%
7	13-Nov-14	0%	0%
Overall trend		-26%	-25%

There was a decreasing trend for overlapping areas between the Moratoriums and the AMSR Concessions (Table 2) where the overlapping areas have become smaller as a proportion of the concession.

Figure 4 illustrates the overlap between the AMSR Concession and Moratorium Revision 3 (implemented November 19, 2012). Moratorium Revision 3 showed no change in overlapping areas in Concession 1 and decreased in overlapping areas in Concession 2 by 411 hectares and 12%.

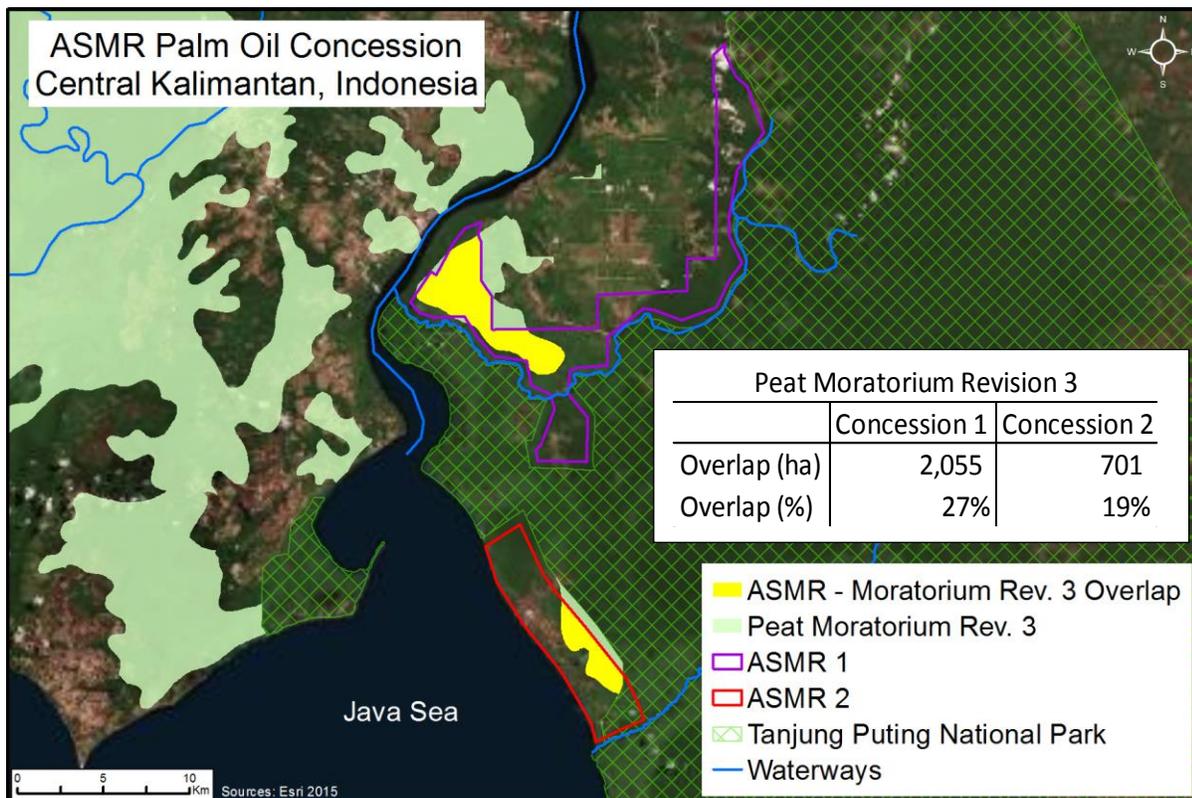


Figure 4. Peat Moratorium Revision 3 (implemented November 19, 2012) overlaps with both AMSR Concession 1 and 2.

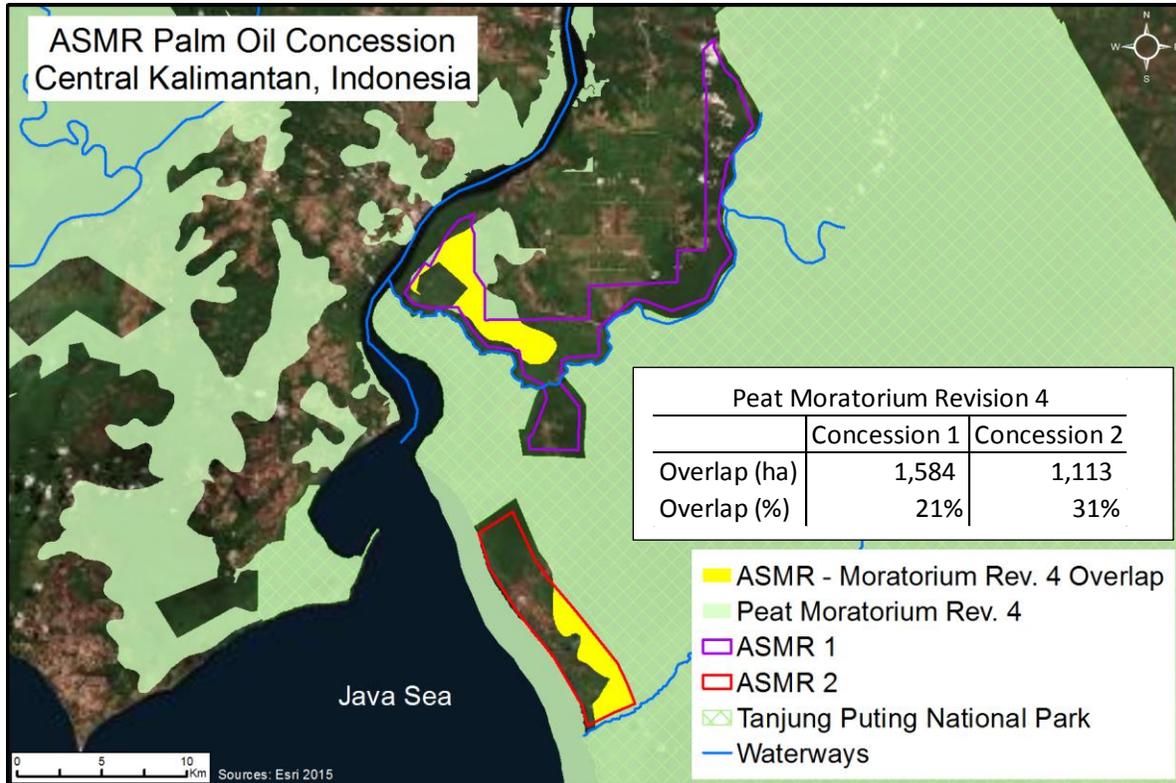


Figure 5. Peat Moratorium Revision 4 (implemented May 16, 2013) overlaps with both ASMR Concession 1 and 2.

Figure 5 illustrates the overlap between the ASMR Concession and Moratorium Revision 4 (implemented May 16, 2013). Moratorium Revision 4 showed a decrease in overlapping area in Concession 1 and an increase in overlapping area in Concession 2. In Concession 1, there were 1,584 hectares overlapping, a 6% increase since the Moratorium 3. In Concession 2, there were 1,113 hectares overlapping with the Moratorium 4, a 12% increase. It appears the same section of overlap in Concession 2 was removed in Moratorium 3 and returned in Moratorium 4.

Figure 6 illustrates the overlap between the ASMR Concession and Moratorium Revision 5 (implemented November 13, 2013). Moratorium Revision 5 showed a decrease in overlapping area in Concession 1 and 2. In Concession 1, there were 129 hectares overlapping, a 19% decrease since the Moratorium 4. In Concession 2, there were 556 hectares overlapping with the Moratorium 5, a 16% decrease since the Moratorium 4.

Moratorium Revision 5 (implemented April 28, 2014) and Moratorium Revision 6 (implemented November 13, 2014) showed little change (1% decrease, 29 ha) in overlapping areas (Table 1, App. Fig. H).

There was no change from Moratorium Revision 6 to Revision 7 (Table 1).

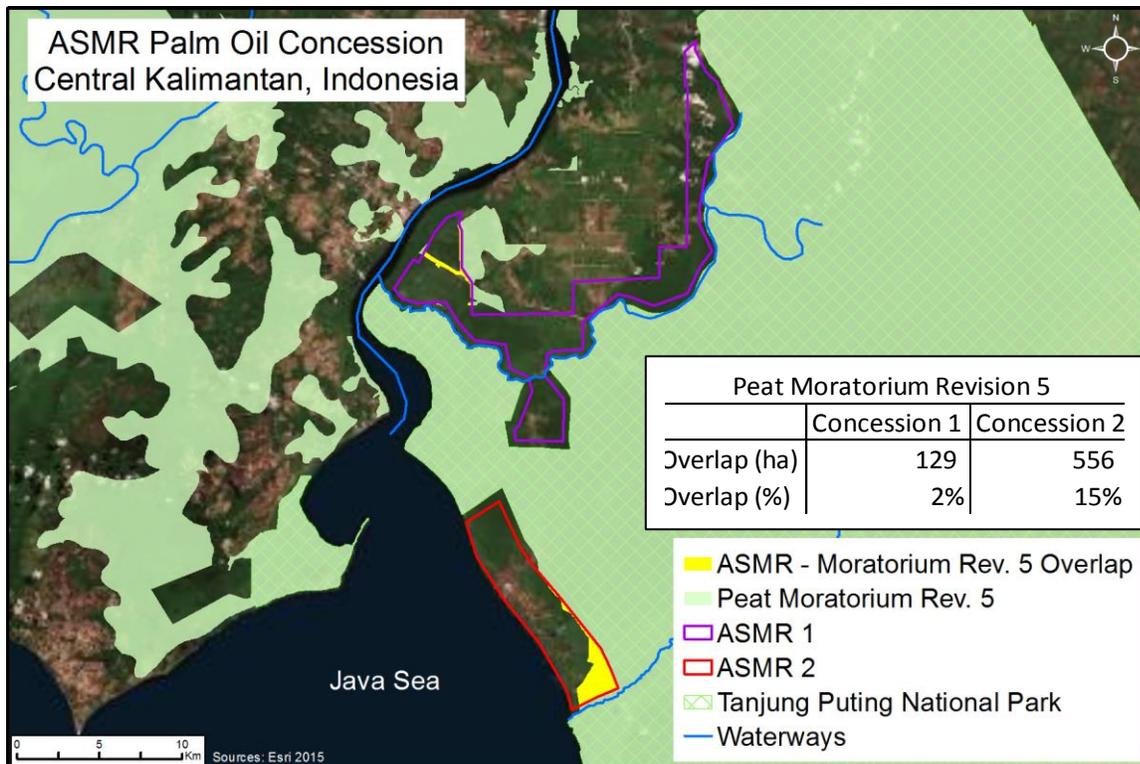


Figure 6. Peat Moratorium Revision 5 (implemented November 13, 2013) overlaps with both ASMR Concession 1 and 2.

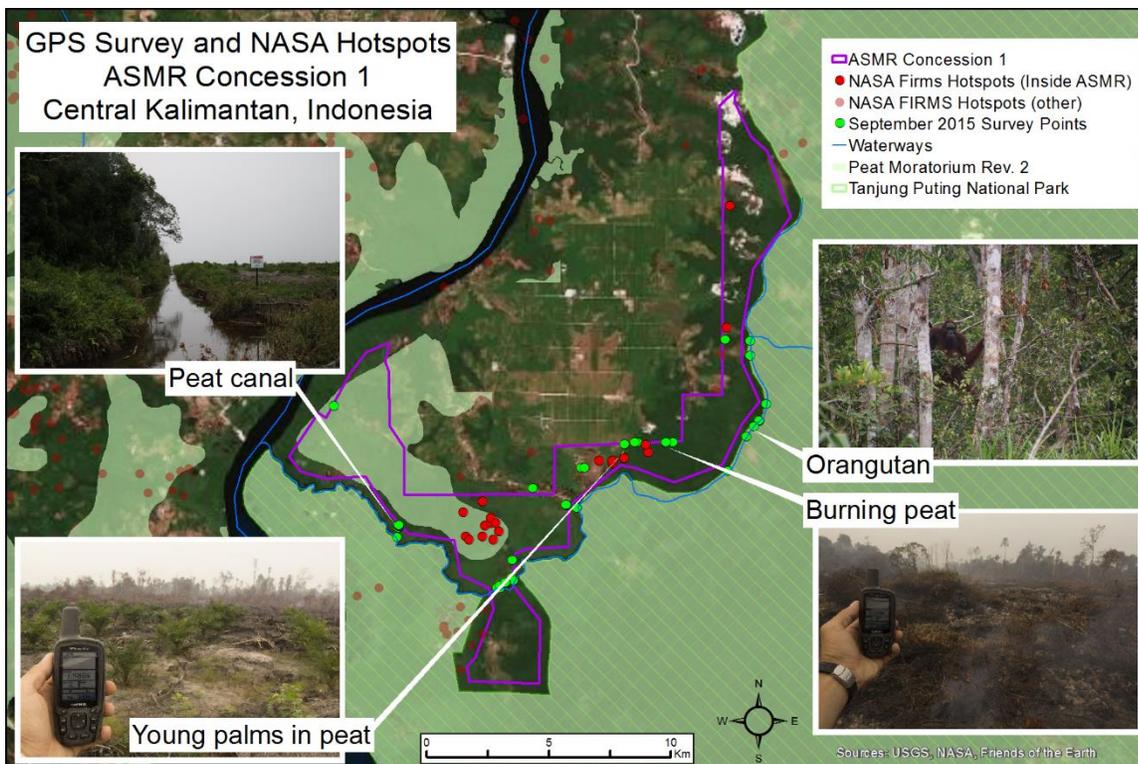


Figure 7. GPS survey points and NASA hotspot in ASMR concession 1. Remote sensing satellite imagery analysis by NASA detected 35 fires between January and November of 2015. Site survey using GPS allowed geolocation of orangutans and nesting sites along with current and recent fires and drainage canals.

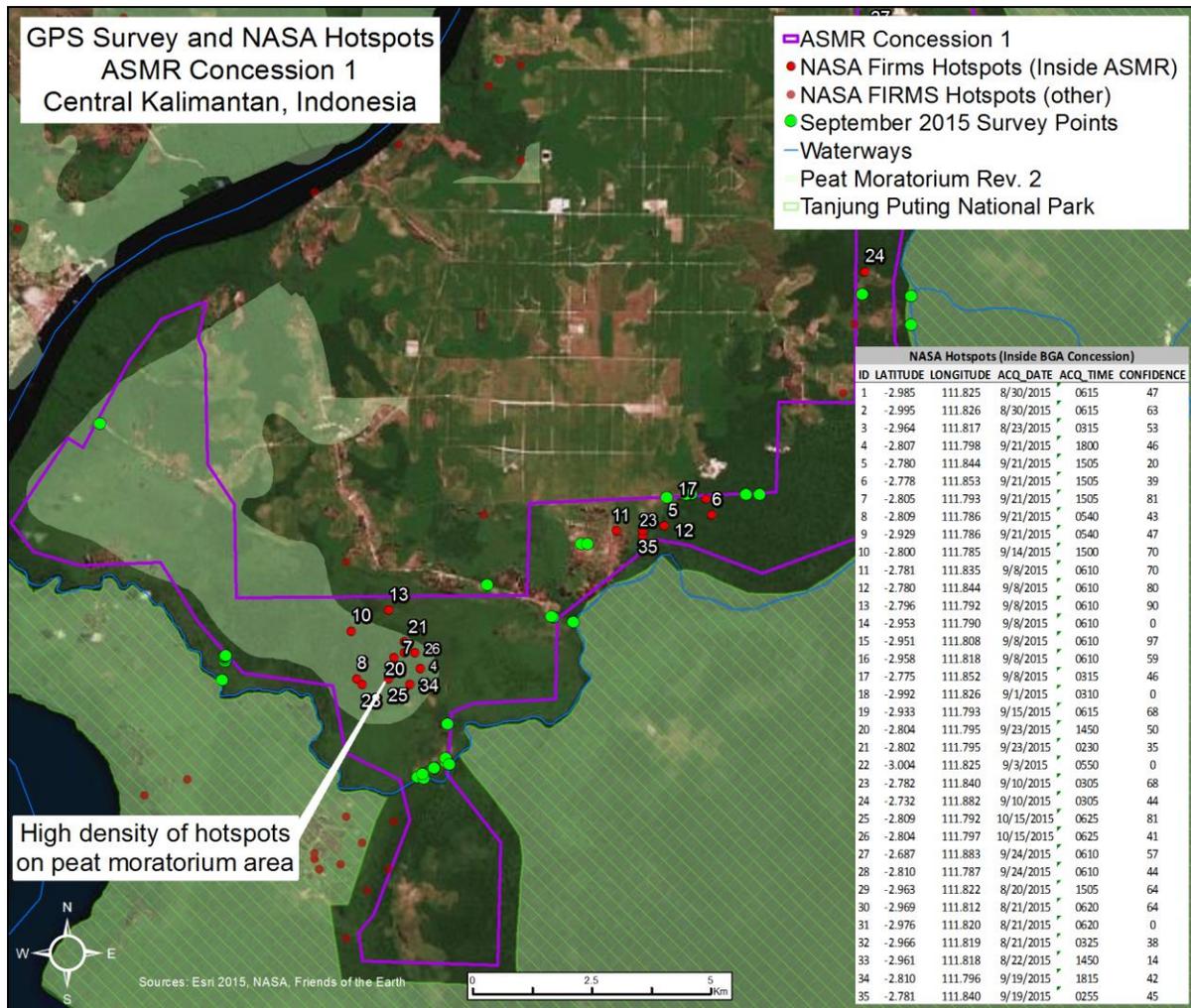


Figure 8a. January to November 2015 NASA hotspots indexed and September 2015 GPS ground survey points in ASMR concession 1. Remote sensing satellite imagery analysis by NASA detected 35 fires between January and November of 2015 across concession 1 and 2 of ASMR. A high-density cluster of 10 hotspots occurred on Rev. 2 peat moratorium area within the ASMR 1 concession between August and September. Index of NASA detected hotspots shows latitude, longitude, date and time of imagery acquisition that was used to detect the fire event, and confidence percentage.

Figure 7 shows geo-located photos taken by Friends of the Earth during a site survey in September 2015, showing canals dug through peat areas, young palms in peat and orangutans confined to a buffer between the concession and the river and burn areas. A high density cluster of NASA identified hotspots was seen on peat moratorium areas within the concession.

Figure 8a is similar to Figure 7, but shows additional hotspot data including latitude and longitude, imagery acquisition date on which the analysis was based, and percent confidence. NASA hotspot data for the larger map extent were from between January and November of 2015, but the hotspots contained within the ASMR concession 1 extent ranged from August to October 2015. NASA hotspot data for ASMR concession 2 (Figure 8b) showed multiple fires had occurred between August and October of 2015 (for hotspot details on ASMR Concession 2, see index in Figure 8a)

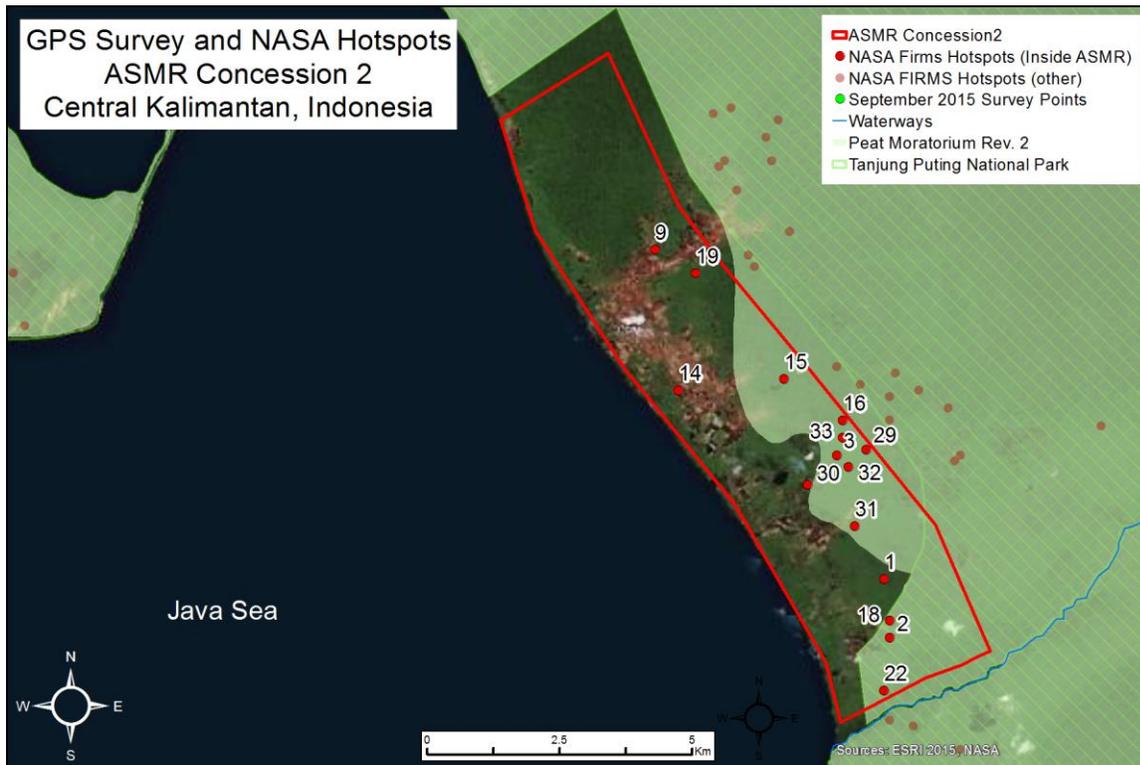


Figure 8b. ASMR Concession 2 with NASA hotspots between January and November of 2015. Most of the detected hotspots in ASMR Concession 2 occurred within Rev. 2 peat moratorium areas.

Most of the hotspots detected in ASMR Concession 2 between January and November of 2015 by the NASA FIRMS system occurred in Rev. 2 peat moratorium areas (Figure 8b).

Figure 9 shows that there are 1,075 hectares overlapping between the BGA Concession and the Moratorium Revision 3 (implemented in November 11, 2011). This is 3% of the total BGA Concession area. The overlapping area does not change for Moratoriums Revisions 2-5.

In Moratorium Revision 7 (implemented November 13, 2014), there were 2,731 hectares of overlapping area with the BGA Concession (Fig. 10). There was no change observed in overlapping areas for Moratorium Revision 6 (implemented November 13, 2014) to Moratorium Revision 7.

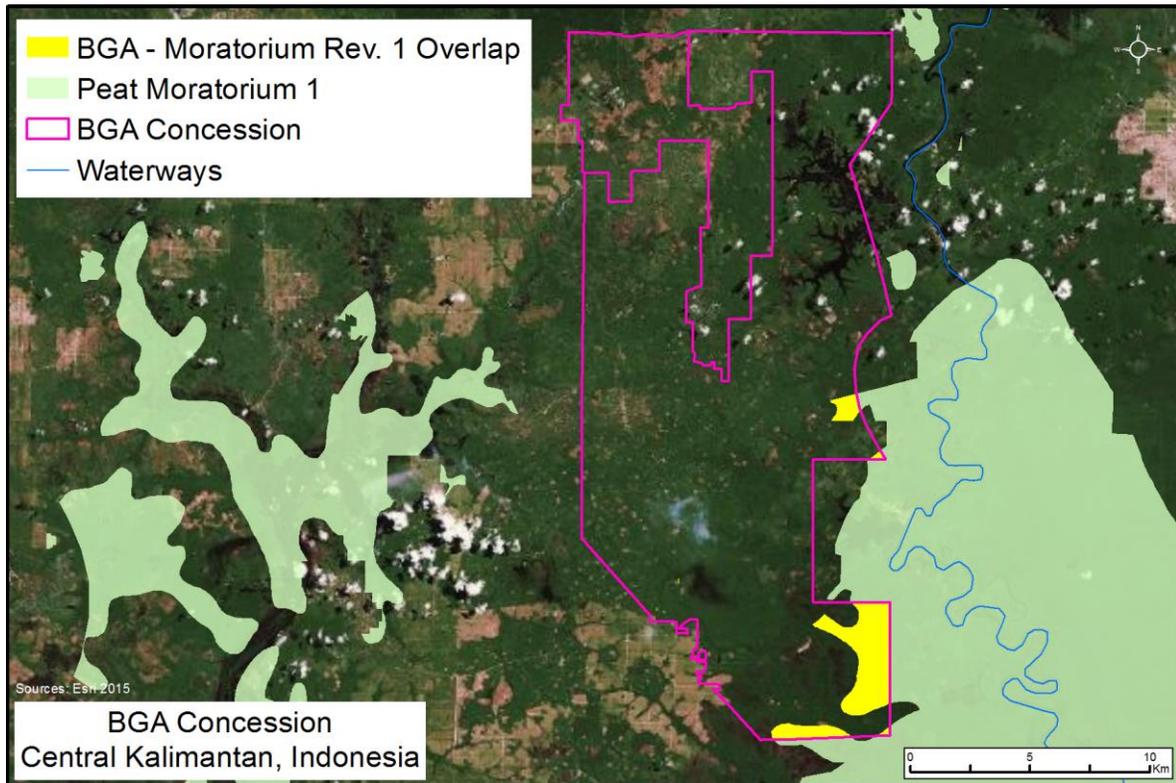


Figure 9. BGA Concession and Moratorium Revision 1 (implemented November 11, 2011) have some overlapping areas.

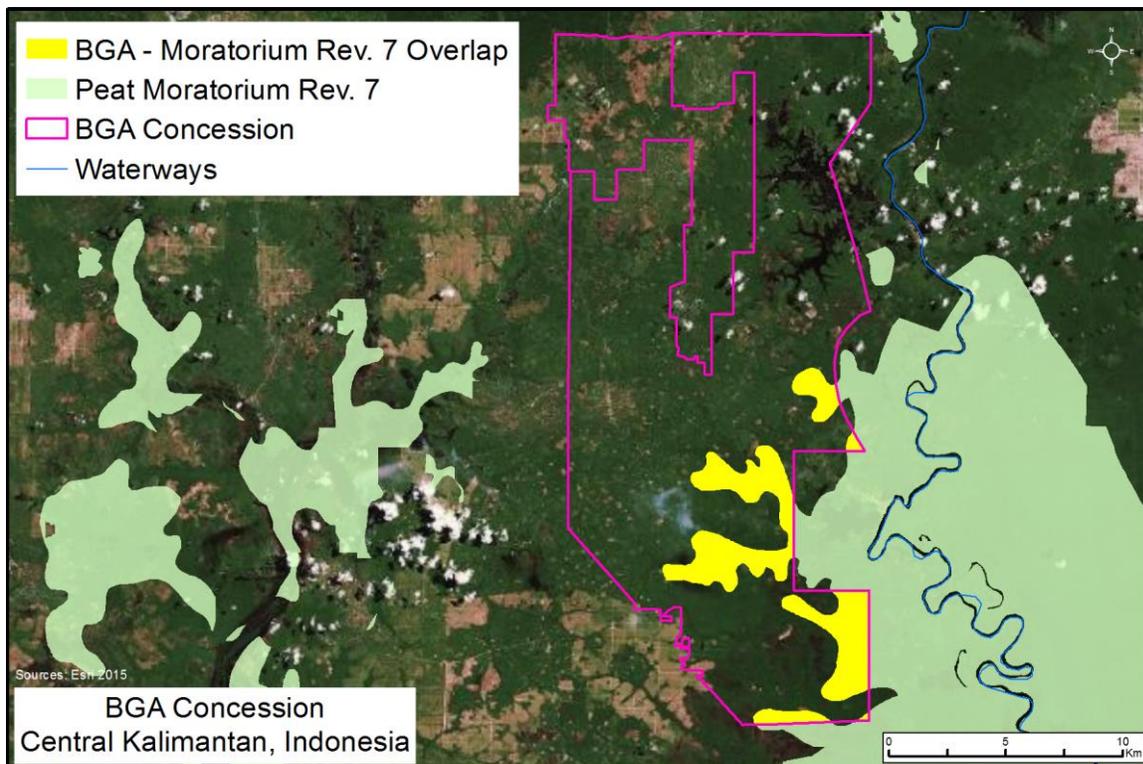


Figure 10. BGA Concession and Moratorium Revision 6 (implemented April 28, 2014) have some overlapping areas.

Figure 11 combines NASA hotspot and GPS survey data showing a correlation between some of the GPS ground-based survey sites where FoE documented active and recent burning and fire hotspots identified by the NASA FIRMS system between January and November of 2015.

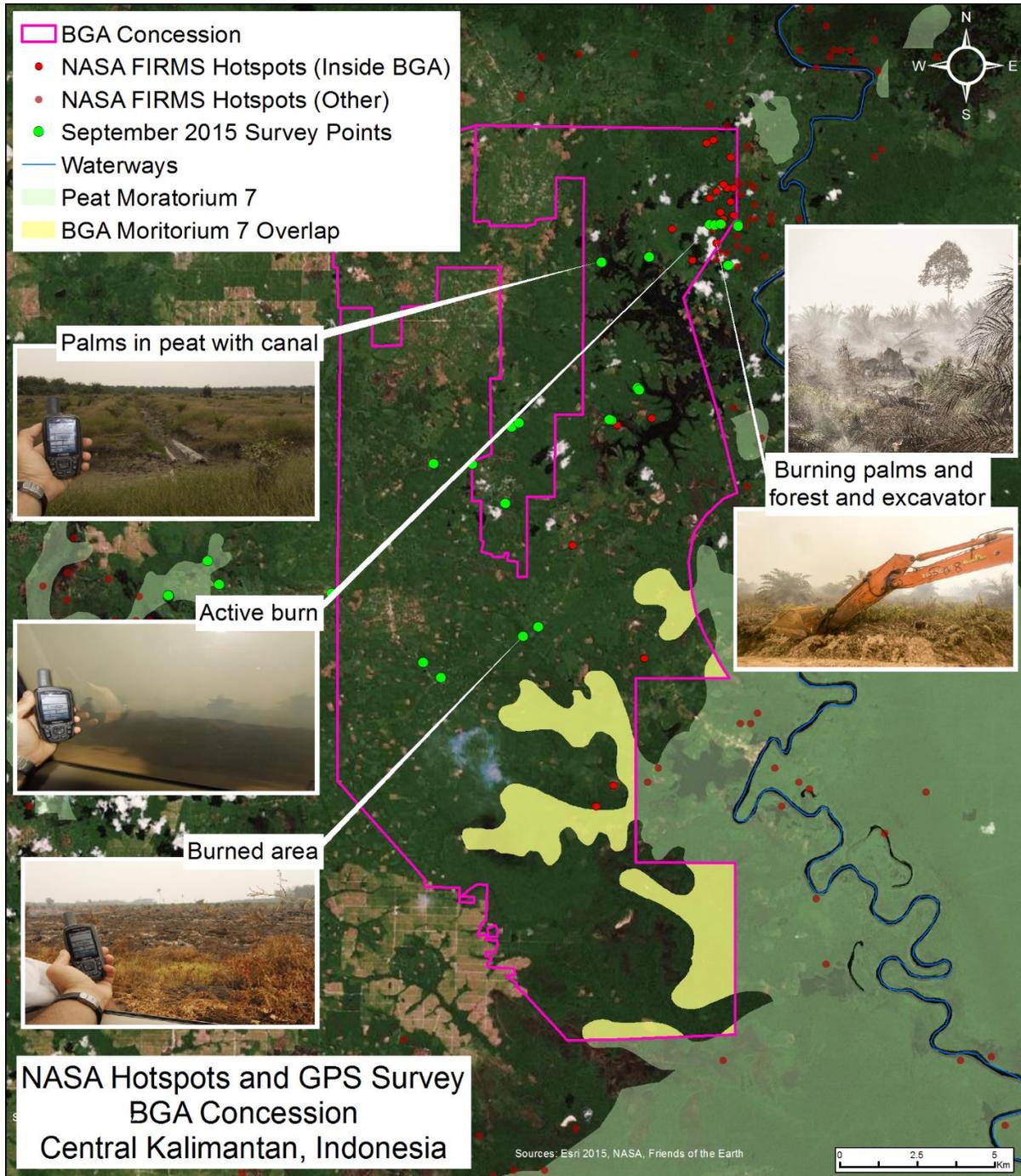


Figure 11. GPS, photo survey and NASA hotspot data in BGA concession. Multiple GPS sites were surveyed where fires were present or had recently occurred, especially in the northeast corner of the concession. This was correlated by multiple remotely sensed hotspot observations.

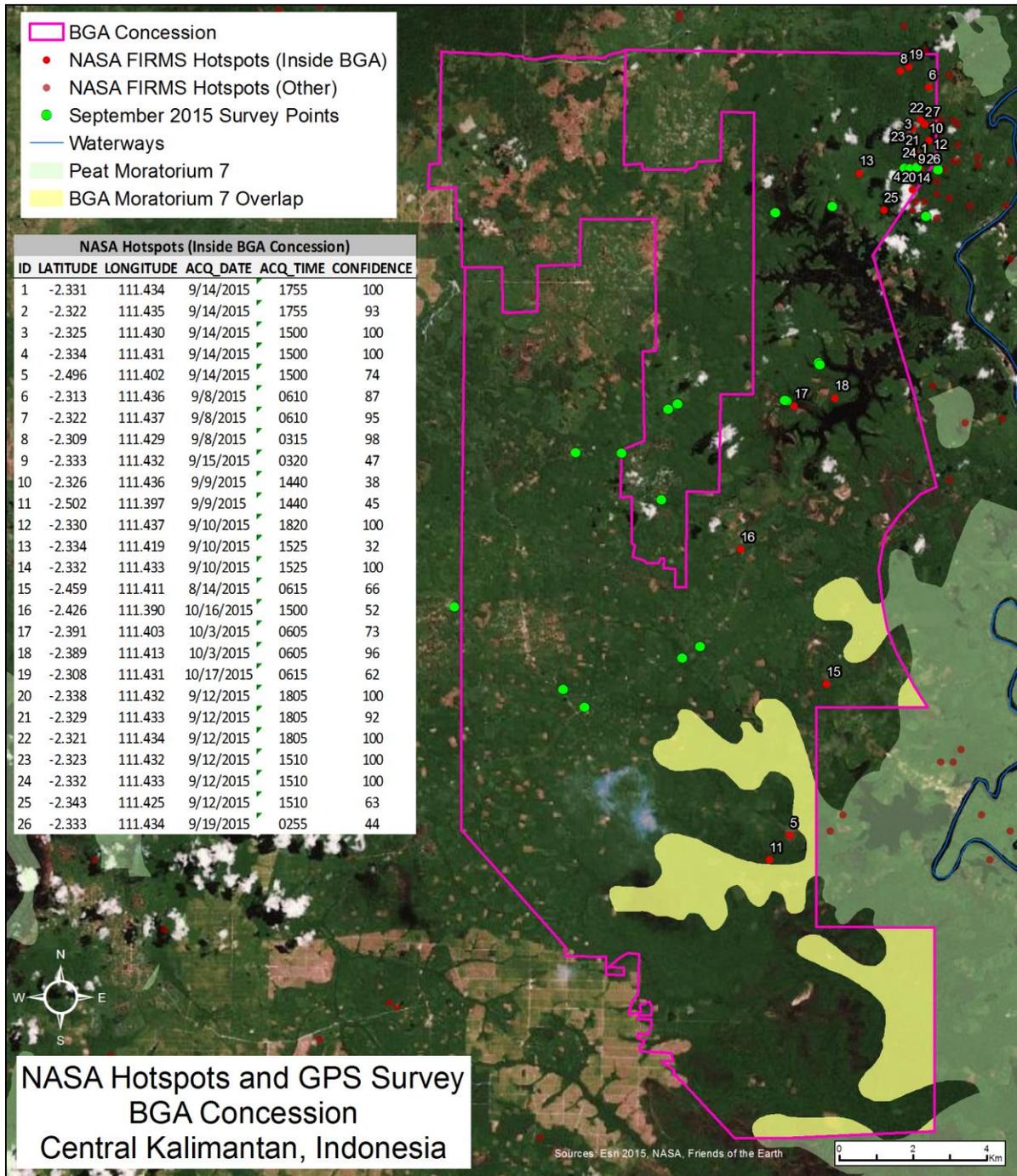


Figure 12. September 2015 GPS survey data and NASA hotspot data from January to November 2015 in BGA concession. Hotspot IDs can be matched against table to determine confidence level and date of occurrence.

Figure 12 is similar to 11, but contains ID numbers for the NASA hotspots inside of BGA Concession which can then be matched to a table which shows degree of confidence and date of acquisition (the day the fire was observed).

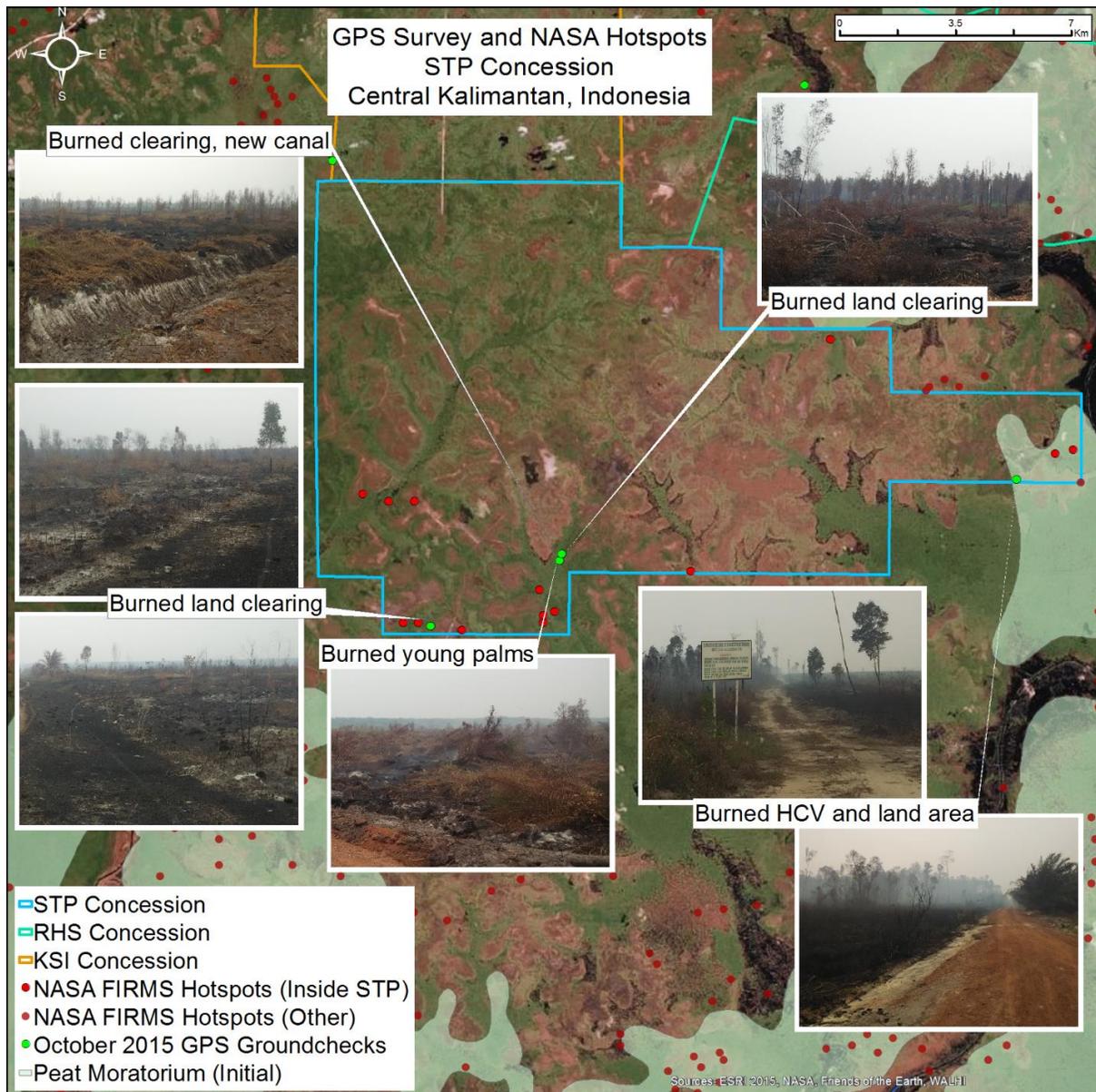


Figure 13. GPS, photo survey and NASA hotspot data in STP concession. Fire activity detected by NASA's FIRMS system was less than in other concessions, but the burned areas that were observed in a site survey showed extensive burning had occurred.

Figure 13 shows less intensive fire activity between January and November 2015 in the STP concession, but ground GPS site survey photos showed fairly extensive burned areas.

Figure 14 is similar to Figure 13, but contains ID numbers for the NASA hotspots inside of the STP concession which can be matched to a table showing the degree of confidence and date of acquisition (the day the fire was observed). There was a fire clusters in the southern part of the concession and extensive burning was confirmed by geo-located ground observations.

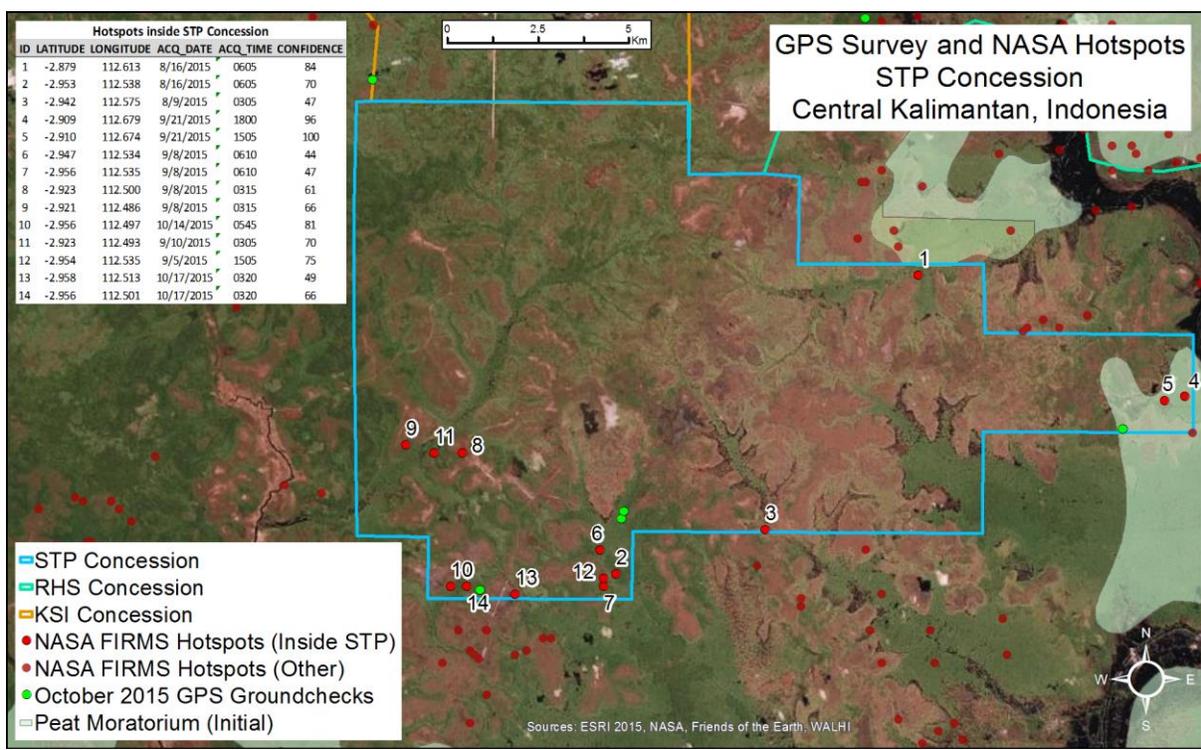


Figure 14. September 2015 GPS survey data and NASA hotspot data from January to November 2015 in STP concession. Hotspot IDs can be matched against table to determine confidence level and date of occurrence.

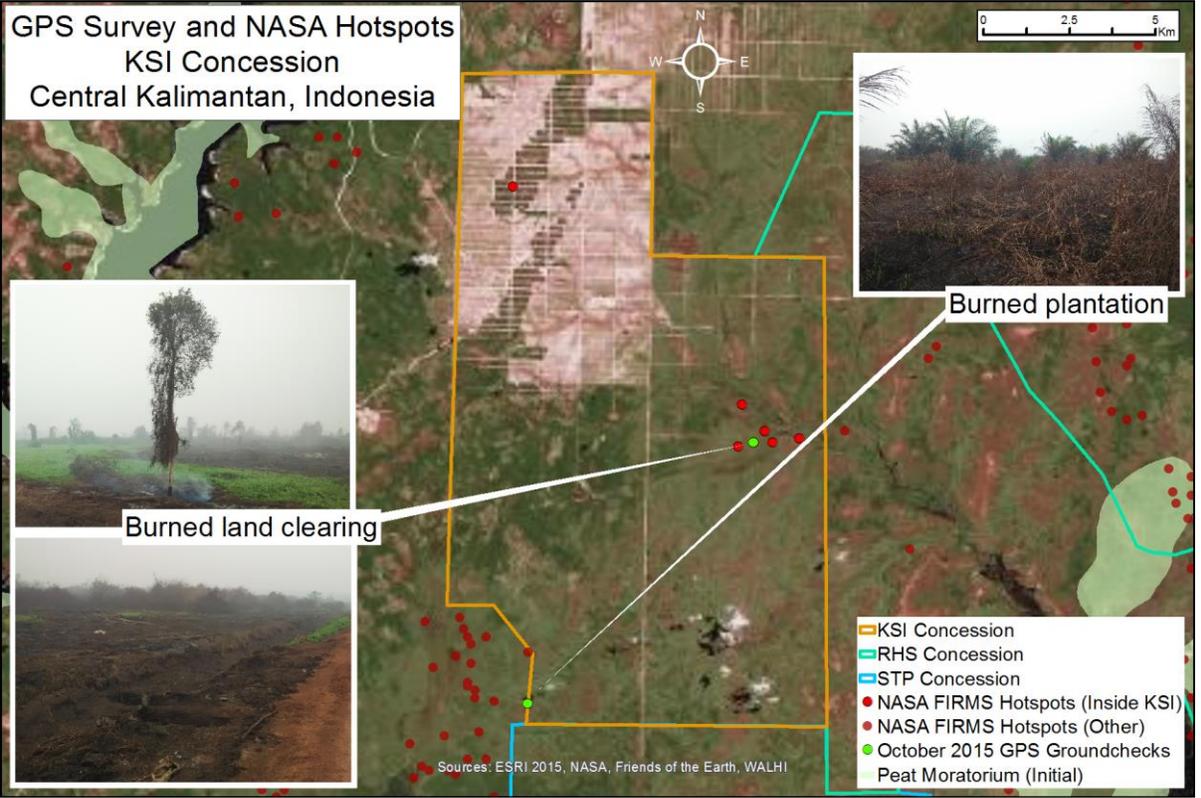


Figure 15. GPS, photo survey and NASA hotspot data in KSI concession. Hotspots detected by remote sensing satellites between January and November of 2015 show a large cluster of fire activity in the southwestern area just outside of the concession and another cluster in the eastern section.

Figure 15 shows clusters of hotspots in or adjacent to the KSI concession that were detected between January and November of 2015 in the southwestern and eastern part of the concession. Geo-located ground observations confirmed that these areas had experienced extensive burning.

Figure 16 shows ID numbers of the NASA hotspots inside of the KSI concession which can be matched to a table showing the degree of confidence and date of acquisition (the day the fire was observed). NASA hotspot data was corroborated by ground observations.

Figure 17 has three large clusters of hotspots that were detected between January and November of 2015 in and around the southeastern part of the RHS concession on Rev. 0 Peat Moratorium lands. Of these, two fire clusters occurred within the concession boundaries. Geo-located ground observations confirmed that these areas were experienced extensive burning.

Figure 18 shows ID numbers of the NASA hotspots inside of the RHS concession which can be matched to a table showing the degree of confidence and date of acquisition (the day the fire was observed). NASA hotspot data was corroborated by ground observations.

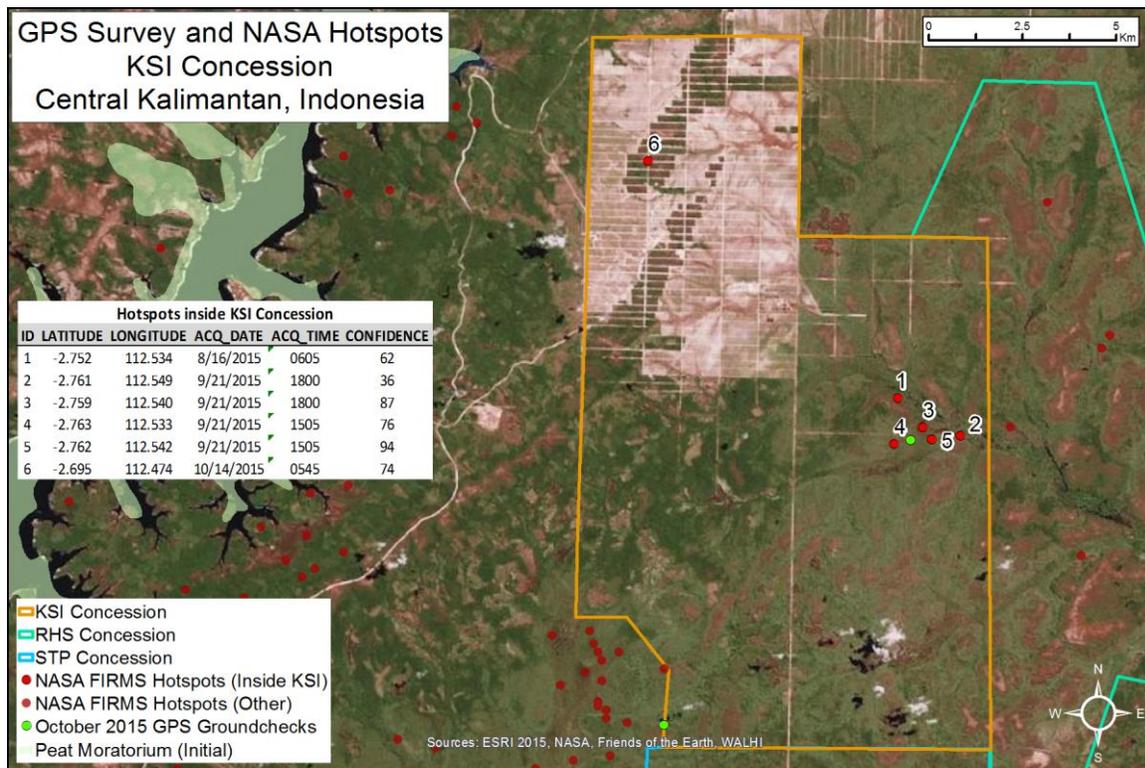


Figure 16. September 2015 GPS survey data and NASA hotspot data from January to November 2015 in KSI concession. Hotspot IDs can be matched against table to determine confidence level and date of occurrence.

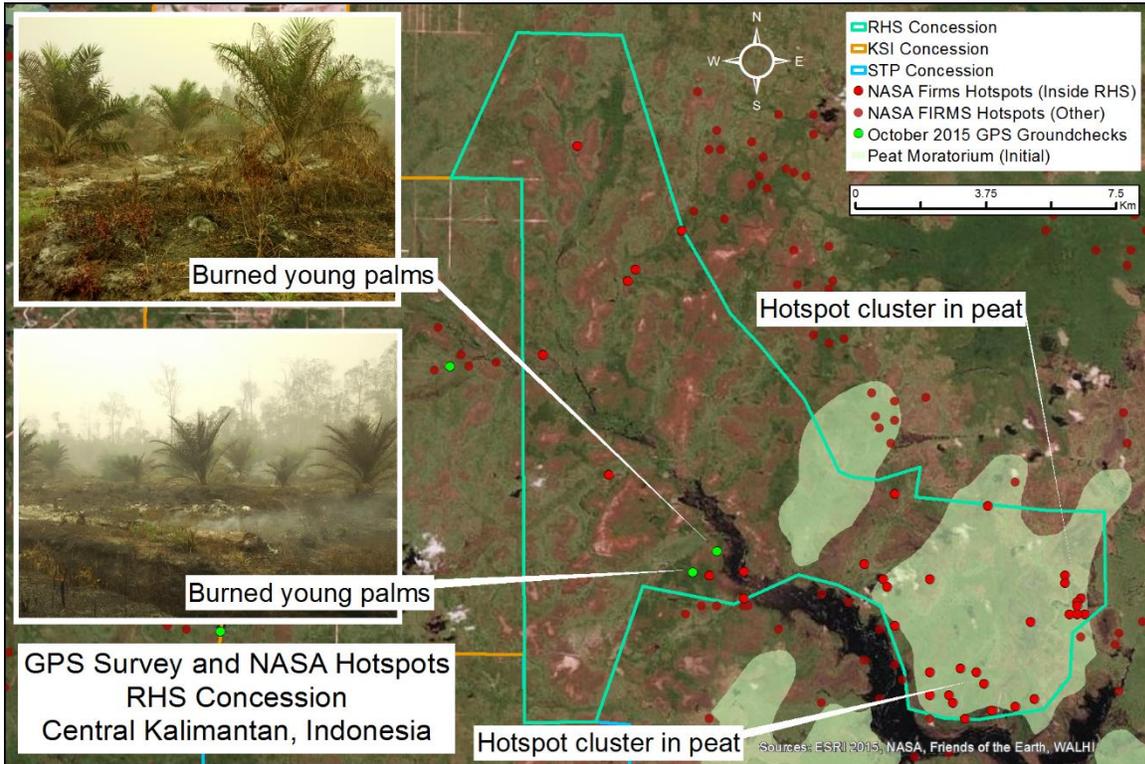


Figure 17. September 2015 GPS survey data and NASA hotspot data from January to November 2015 in RHS concession. Hotspots detected by remote sensing satellites between January and November of 2015 show two large clusters of fire activity in the southern part of the RHS concession including a large cluster that straddles the concession boundary and which occurred on Rev. 0 peat moratorium lands.

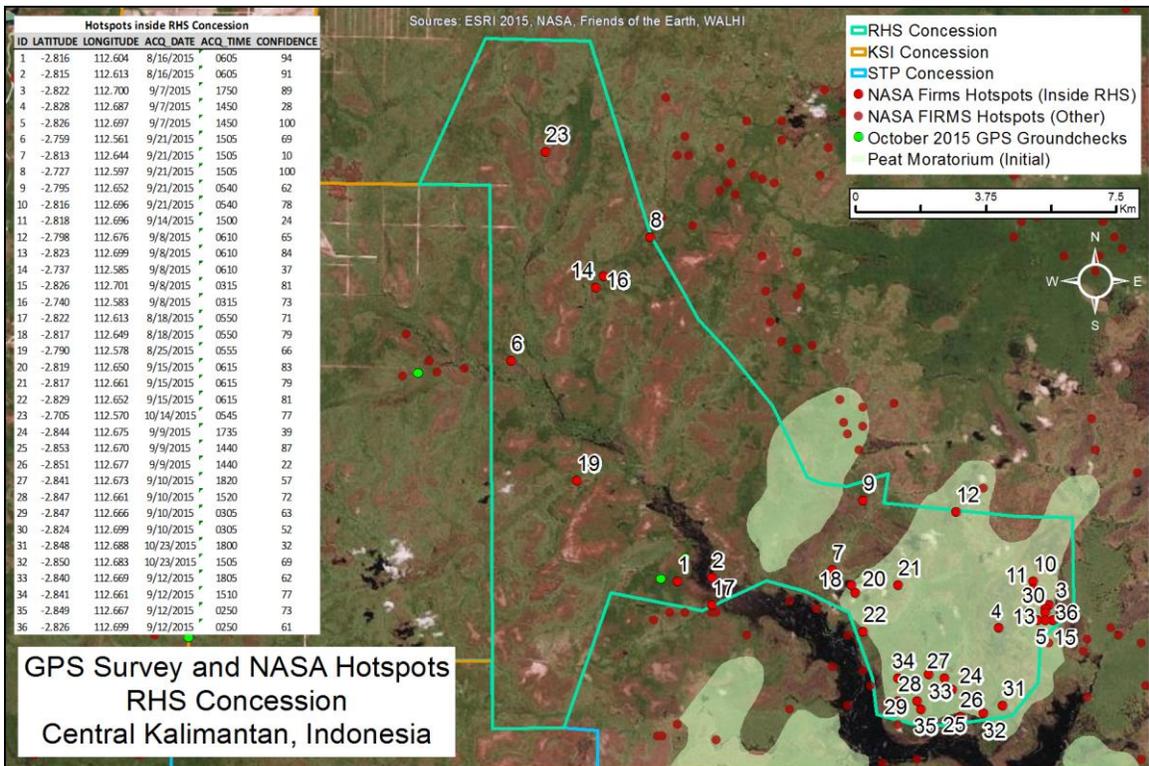


Figure 18. September 2015 GPS survey data and NASA hotspot data from January to November 2015 in RHS concession. Hotspot IDs can be matched against table to determine confidence level and date of occurrence.

APPENDIX

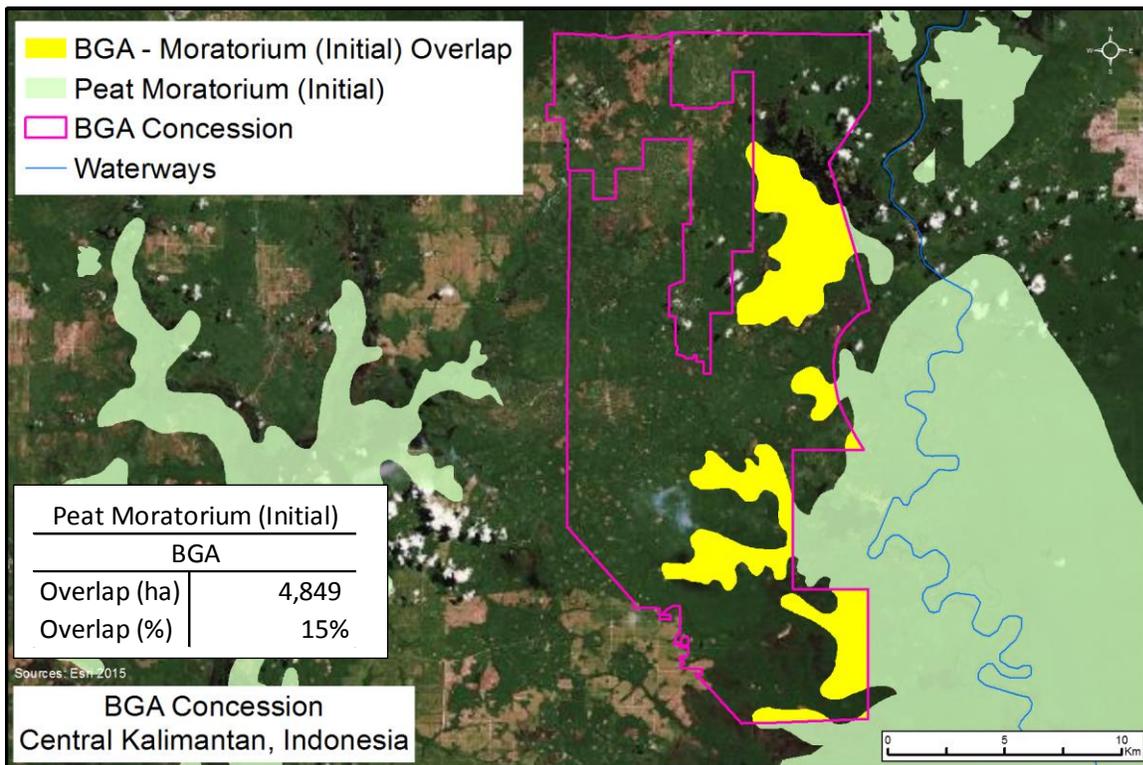


Figure A. BGA Concession and the initial Moratorium (implemented June 20, 2011) have some overlapping areas.

There are 4,849 hectares of overlapping space between the BGA Concession and the initial moratorium (implemented in June 20, 2011) (Fig. A).

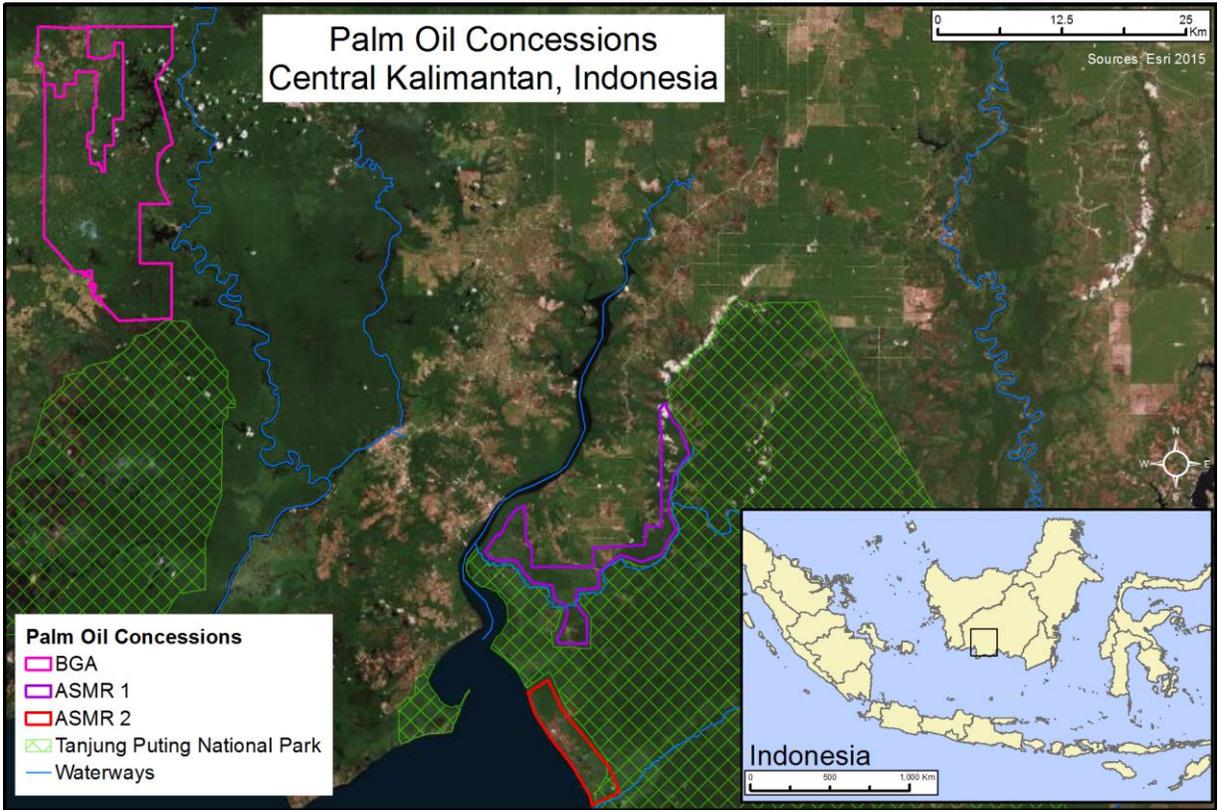


Figure B. BAL palm oil concessions in Central Kalimantan, Indonesia.

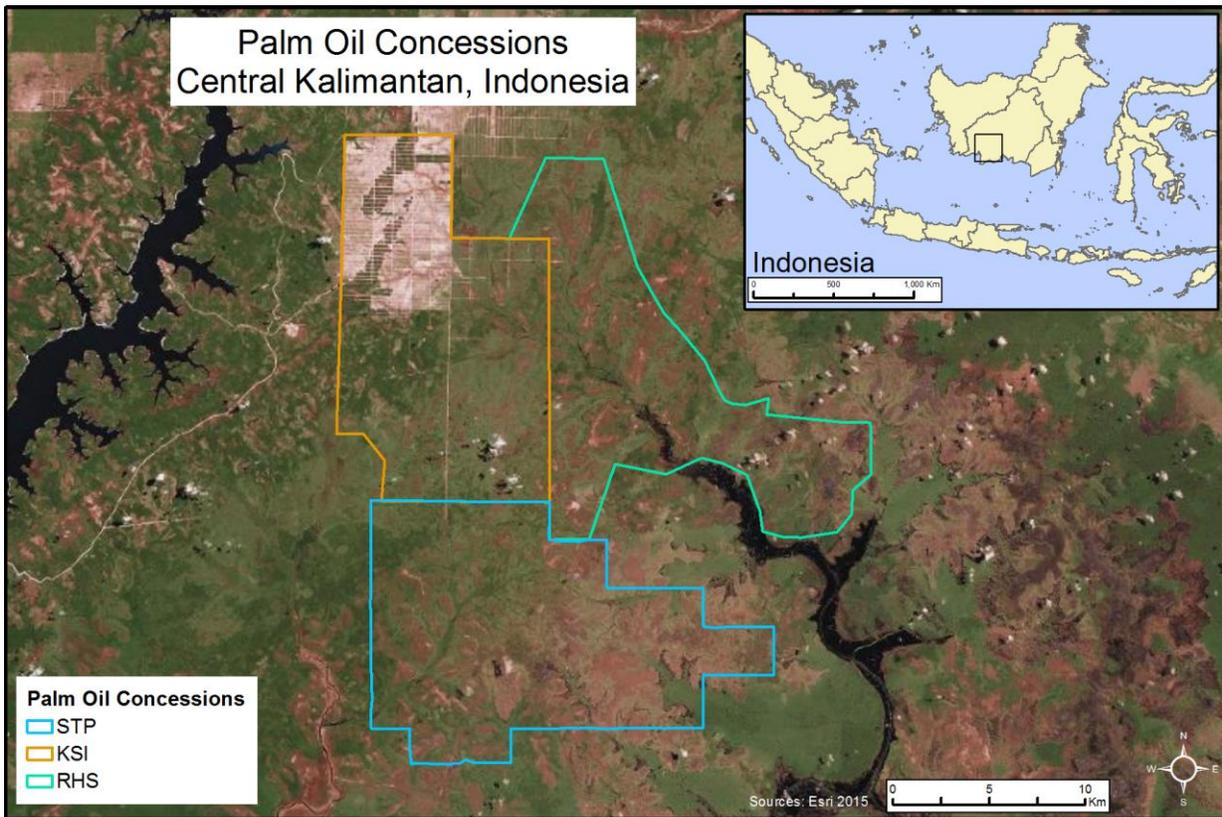


Figure C. Wilmar palm oil concessions in Central Kalimantan, Indonesia.

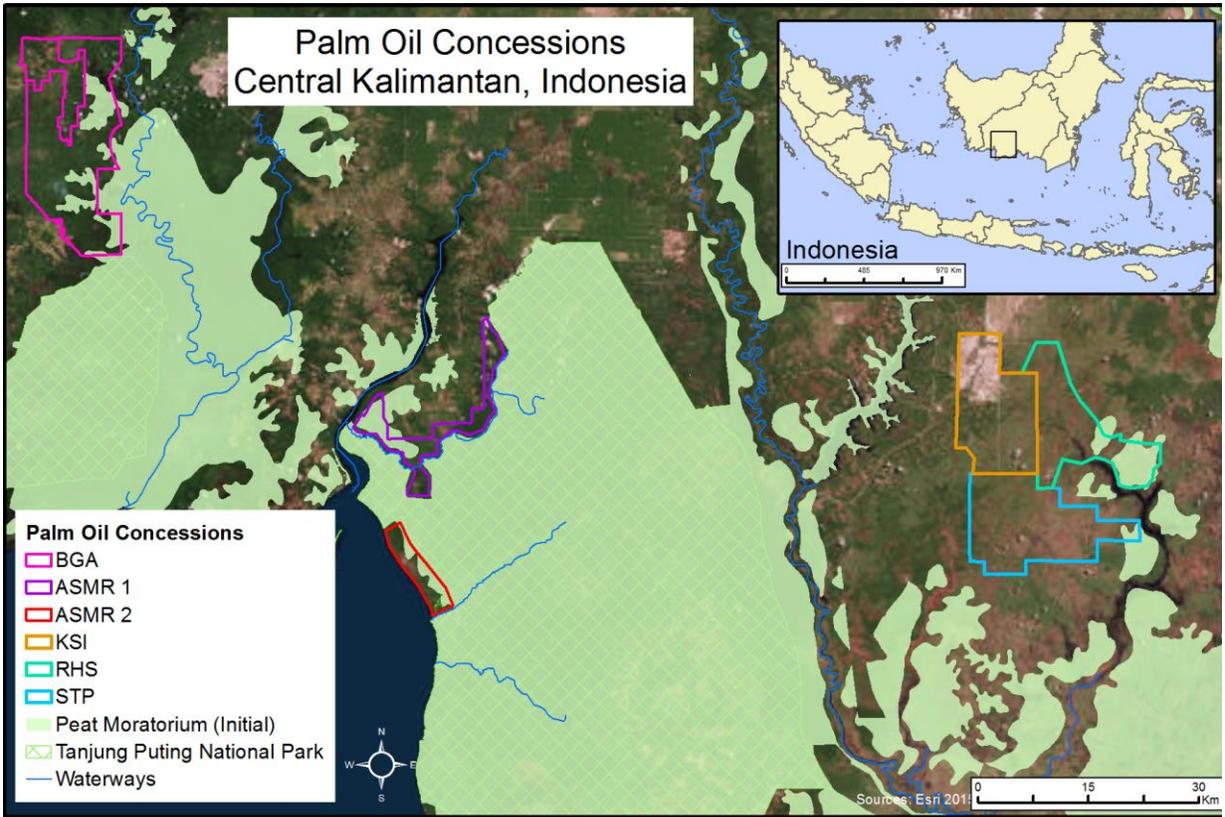


Figure D. Palm oil concessions and the initial Peat Moratorium (implemented in June 20, 2011) in Central Kalimantan, Indonesia.

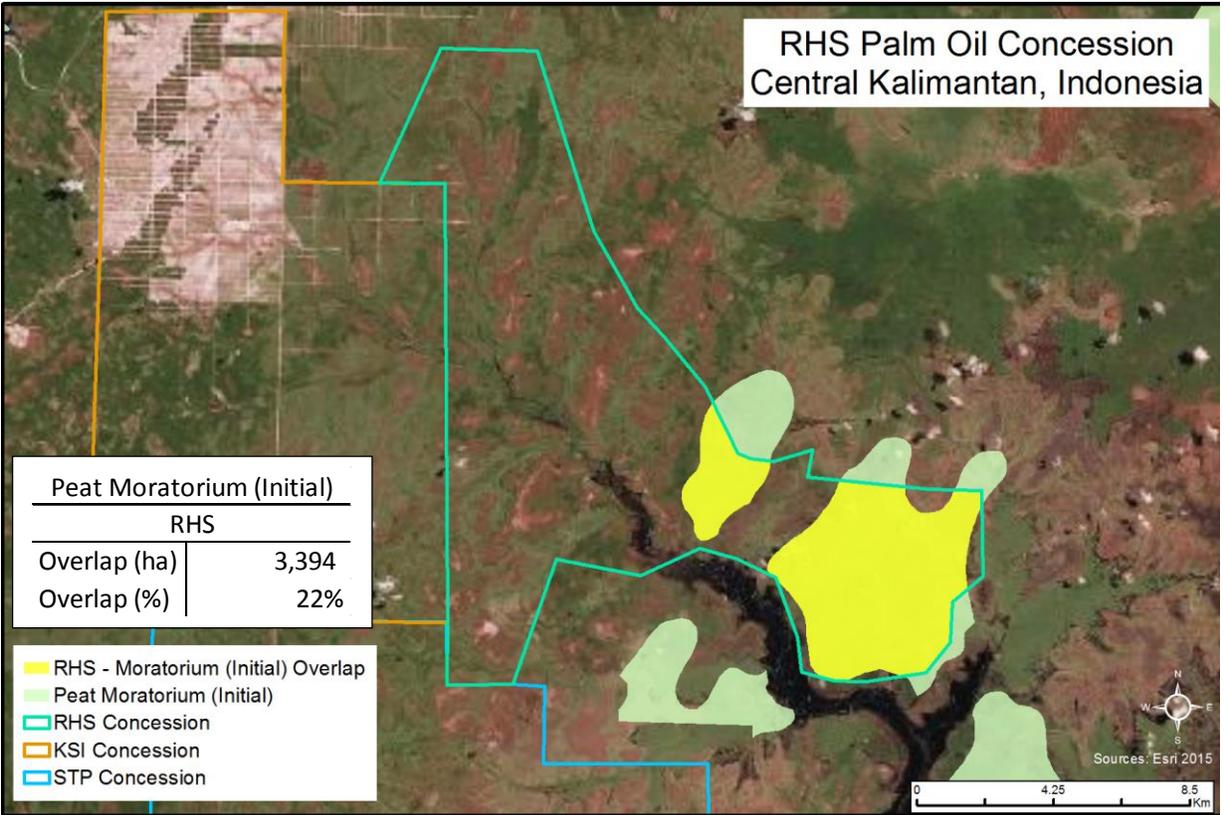


Figure E. RHS palm oil concession and the initial Peat Moratorium (implemented in June 20, 2011) in Central Kalimantan, Indonesia.

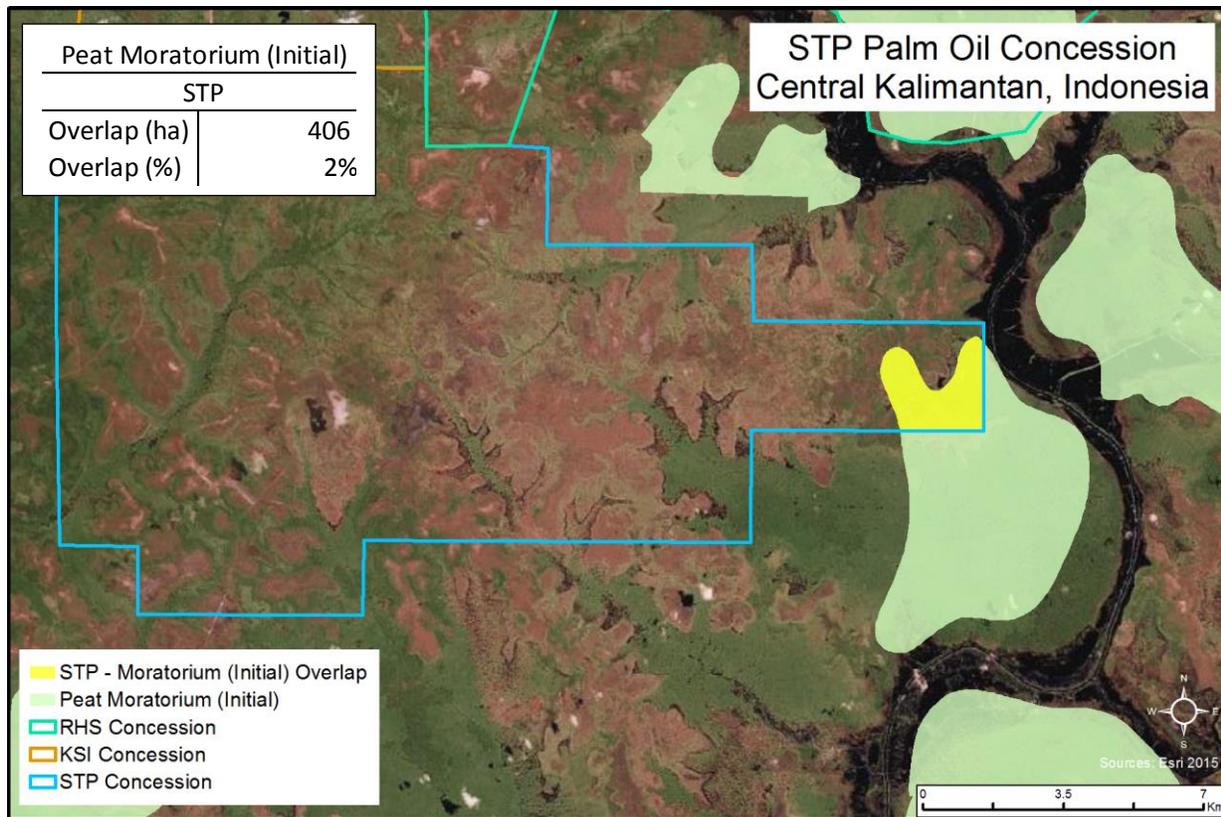


Figure F. STP palm oil concession and the initial Peat Moratorium (implemented in June 20, 2011) in Central Kalimantan, Indonesia.

Figure E shows the overlap of RHS Concession and the initial moratorium (implemented in June 20, 2011) which was 3,394 hectares. After the initial Peat Moratorium, peat protections were removed from within the boundaries of STP and RHS.

Figure F shows the overlap of STP Concession and the initial Moratorium which was 406 hectares.

Figure G shows the extent of the initial Peat Moratorium (implemented in June 20, 2011) and the most current Peat Moratorium Revision 7 (implemented in November 13, 2014) within the Central Kalimantan Province.

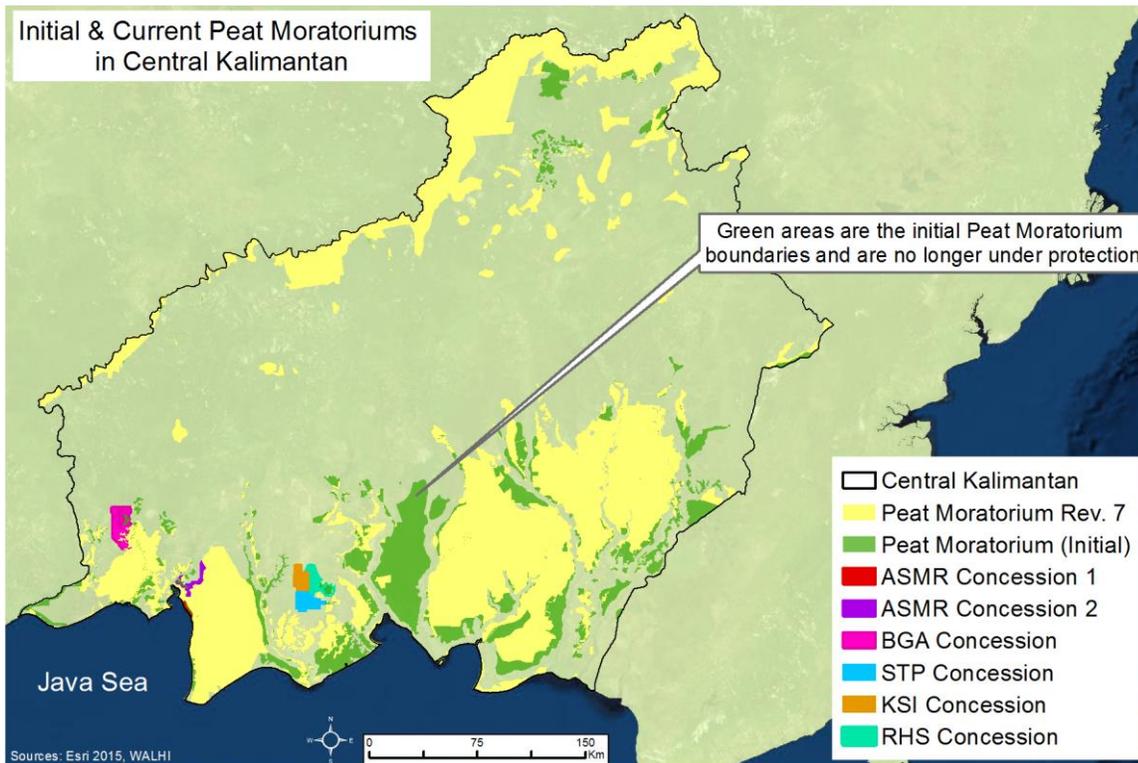


Figure G. Central Kalimantan and Peat Moratorium Initial and Revision 7 overlay. Green areas indicate portions that have been removed from the Peat Moratorium since its inception and represents a 19% loss of moratorium area within Central Kalimantan.

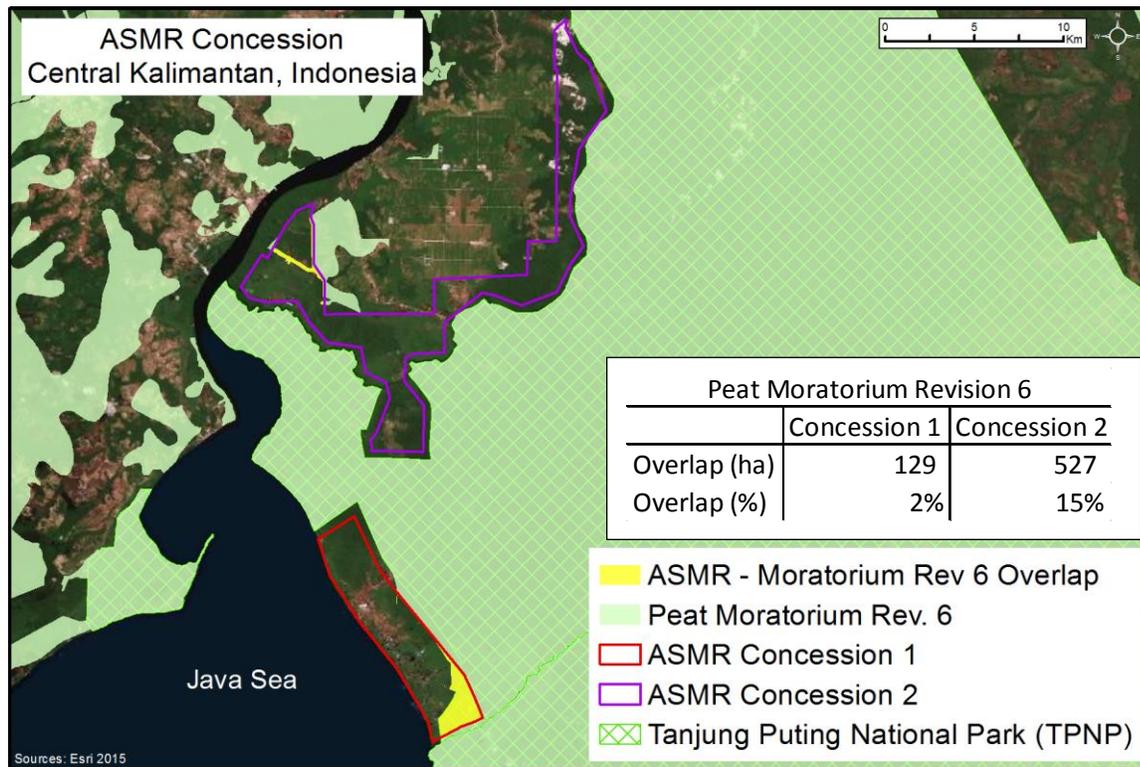


Figure H. ASMR Concession and Moratorium Revision 6 (implemented April 28, 2014) have some overlapping areas.

Table A includes the total areas (ha) for all palm oil concessions used in this analysis.

Table A. Total area in hectares for the palm oil concessions analyzed in this report.

Palm Oil Concession	Total Area (ha)
ASMR	11,147
BGA	31,440
KSI	17,062
RHS	15,298
STP	20,147

Table B includes the total area for each Moratorium revision, implementation date, percent change and the overall trend.

Table B. Total area in hectares for the palm oil concessions analyzed in this report.

Mor. Rev.	Implementation Date	% Change
Initial	20-Jun-11	0
1	22-Nov-11	-7%
2	6-May-12	-2%
3	19-Nov-12	-75%
4	16-May-13	254%
5	13-Nov-13	3%
6	28-Apr-14	-2%
7	13-Nov-14	-1%
Overall trend		-19%