A Deforestation Probability Surface in support of the vegetation monitoring in the Brazilian Cerrado biome

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INTRODUCTION

In 2018 the Brazilian government launched the deforestation monitoring system in the Cerrado - PRODES-Cerrado (INPE, 2018), under the project Development of systems to prevent forest fires and monitor vegetation cover in the Brazilian Cerrado (CLIMATE INVESTMENT FUNDS, 2018), mapping the conversion of native vegetation from 2000 and revealing that, currently, Cerrado has only ~ 50 % of original vegetation cover (figure 1). Other product of the project is the Deforestation Polygon Assessment Tool, which will assign a quality score for all deforestation (figure 2).

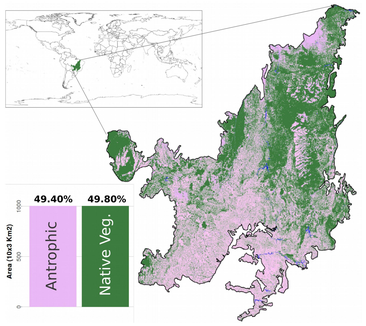

Figure 1. Anthropic area and native vegetation of the Cerrado biome, in 2017, according to PRODES-Cerrado mapping.

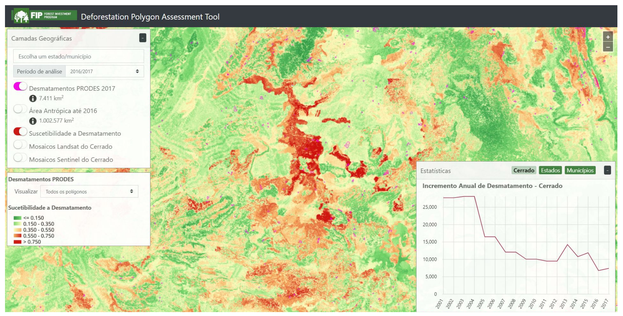

Figure 2. The Deforestation Polygon Assessment Tool (D-PAT, 2018), a platform that will assign a quality score for all PRODES-Cerrado deforestation polygons, considering the socioeconomic, soil, climatic and infrastructure data; the trends of deforestation expansion and the analysis of satellite time series (http://dpat.lapig.iesa.ufg.br).

DATA AND METHODS

The creation of a Deforestation Susceptibility Surface was based on synthesis of the influence of different types of data (soil, climate, topography and infrastructure) for evaluate the occurrence of new deforestation areas. Two sizes of deforestation were considered: larger than 0.5 km² and smaller than 0.5 km². The time interval for this influence analysis corresponded to the period from 2010 to 2015.

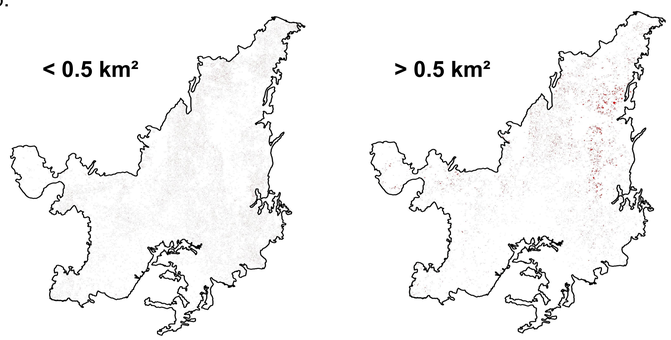

Figure 3. Deforested areas in the Cerrado between 2010 and 2015, greater or less than 0.5 km². Source: PRODES-Cerrado

The relationships between a dataset (represented by 11 spatial metrics) and deforested areas from 2010 to 2015 were analyzed by the Weights of Evidence method, incorporated in the Dynamic EGO software. This method consists of 3 main steps: 1) categorization of continuous spatial metrics; 2) determination of coefficients of influence of each metric in a given event; 3) calculation of susceptibility surface.

Two different Deforestation Susceptibility Surface were created: deforestations larger than 0.5 km² and smaller than 0.5 km².

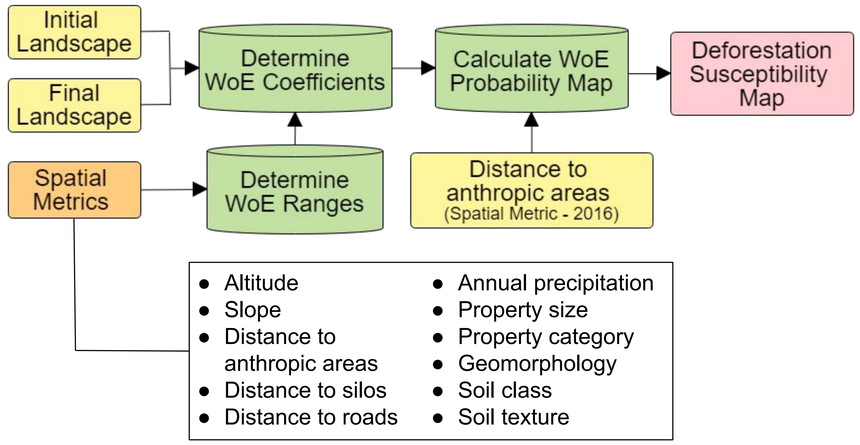

Figure 4. Data and methods used for the creation of Deforestation Susceptibility Surface, created from the relation of occurrences between 2010 and 2015 (greater or less than 0.5 km²) and 11 spatial metrics.

RESULTS

The result shows a relationship between susceptibility to deforestation greater than 0.5 km² and the areas of highest agricultural potential. A higher concentration of these areas occurs in the northern portion of the Cerrado, in the region known as "MATOPIBA" (a recent Brazilian agricultural frontier with a large proportion of native vegetation remaining). On the other hand, areas with high susceptibility to deforestation of less than 0.5 km² corresponded to regions with moderate or low agricultural potential (Figure 5).

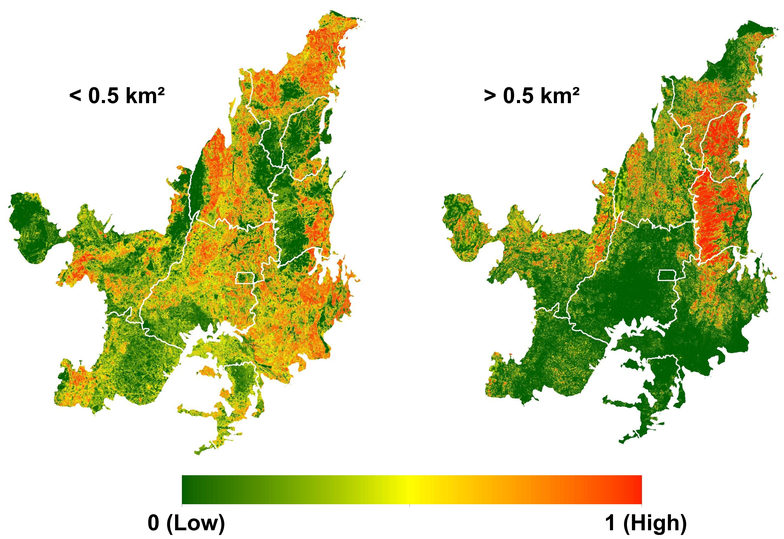

Figure 5. Two Deforestation Susceptibility Surfaces: for occurrences greater than 0.5 km² and less than 0.5 km ².

There is also a less concentrated distribution of regions with high susceptibility to deforestation of less than 0.5 km². One interpretation is that the areas in southern portion of the Cerrado are of older agricultural use), with small remaining fragments of native vegetation.

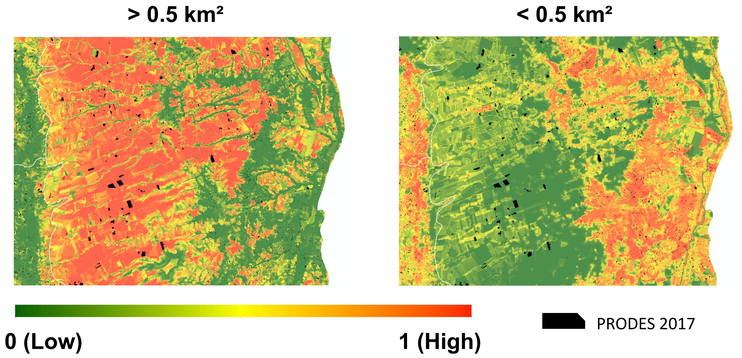

Figure 6. Deforestation Susceptibility Surface with occurrences of deforestation (PRODES-Cerrado) in 2017. The example is located in the western part of the state of Bahia, within the region known as "MATOPIBA".

The crossing of deforestation occurrences detected by PRODES-Cerrado in 2017 with surfaces corresponding to their respective sizes, shows a proportional increase between the number of occurrences and their respective ranges of susceptibilities. However, the interval corresponding to deforestation between 0.25 km² and 0.5 km² does not show a good adequacy to the surface generated in this study.

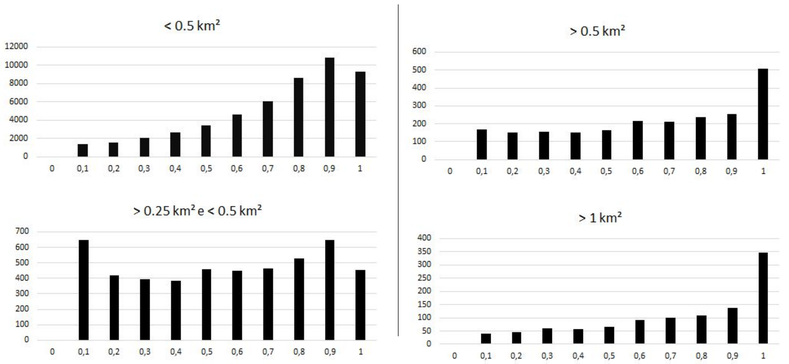

Figure 7. Distribution of number of deforestation detections (2017) on the two deforestation susceptibility surfaces.

FINAL REMARKS

- There is a difference in observed patterns of deforestation smaller than and greater than 0.5 km².
- The patterns of spatial distribution of susceptibility to deforestation, for both sizes, are related to agricultural potential and remaining amount of native vegetation.
- The surfaces created in this study can contribute to elaboration of a quality score for new detection of deforestation.

REFERENCES

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