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LOCALIZATION AND IDENTIFICATION OF PPAs IN THE STREAM SANTO ANTONIO - SÃO MANUEL (SP) WATERSHED IN FUNCTION OF THE ENVIRONMENTAL LEGISLATION, THROUGH OF GEOPROCESSING TECHNIQUES

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ABSTRACT

The present work sought to the geotechnology use in the mapping of soil use in areas of APP's, allowing their delimitations and diagnosis of possible humane interventions. The watershed with 4286.15ha, locates among the geographical coordinates 22° 31' 52" to 22° 38' 20" of latitude S and 48° 33' 40" to 48° 38' 47" of longitude WGr. The used cartographic bases were the letter planialtimetric for the georeferencing of the image of satellite of 2011. SIG-IDRISI Selva was used in the supervised classification and the determination of the areas of the thematic map. The soil use showed that the culture of the sugar-cane occupies most of the area (81%), showing with that the predominance of the agricultural occupation in the area. The image and the use of SIG important tools were shown, supplying reliable results in a small interval of time. The obtained data will aid in the futures plannings of recovery of the area, because they made possible the verification that the area is not being preserved environmentally, link fact of presenting only 12.54% of forests, and the minimum demanded by the legislation of the Brazilian Forest Code effective is of 20%.

Keywords: environmental legislation, geographical information system, environmental preservation.

1. INTRODUCTION

In the last two decades it has been increasing the world concern regarding the fast growth of the tax of deforestation of the tropical forests and of his impact in the biodiversity of the Planet. For this reason, they were created in law the permanent preservation areas (PPA's) with the intention of avoiding the degradation of the ecosystem, to promote the conservation of the natural atmosphere and the maintenance of the life quality.

Such areas, in several cases, as in relation to the steepness, tops of hills, margins of the hydric resources and nascent of the springs, they have not been respected properly, due to the inadequate use of the natural resources. The natural resources, fertile soils and the remaining native forests were intensely reduced in most of PPA's, in many cases, for the ignorance of the population and for his/her incorrect interpretation of the Forest Code. As it observed of Silva

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(1996), the permanent preservation areas should be covered by original vegetation, being delimited the inappropriate areas for the use of lands.

Besides, we lived a socioeconomic model in which the urban development presents permanent conflict with the environment, due to the absence, in a lot of times, of a planned occupation. In this context, the knowledge of the use areas a certain area, besides making possible the appropriate direction of the handling type, allows to identify possible problems carted by the effect of the actions for human on those areas, tends direct relationship with the conservation and the maintainable exploration of the natural resources. At the same time, the appropriate planning of the soil should constantly be accomplished for the degradation not to happen or, at least, be reduced along those areas, mainly of PPA's.

Inside of the environmental administration, one of the main difficulties with that she have been confronting is the lack of a source of data with basic information of the landscape. Such information are extremely necessary in environmental projects, especially to accomplish the reorganizing of degraded areas, supplying aid to the handling and the conservation of the soil and of the water in the hydrographic watersheds.

Like this, the incorporation of coming information of sensor remote orbital to the Geographical Information Systems (SIG) allied to the effective processing capacity, analysis and manipulation that these offer, he becomes possible to the verification of areas submitted to the restrictions imposed by the Forest Code, their irregularities, as well as the recovery possibility.

In that way, the present work seeks to the geotechnology uses in the collection of data and in the mapping of soil use in areas of PPA's, allowing their delimitations and diagnosis of possible interventions humans, contributing to future environmental fiscalizations, in agreement with the Federal Law N° 4.771, 1965 that instituted the Brazilian Forest Code and the resolutions CONAMA N° 04/1985 and n° 303/2002.

2. MATERIAL AND METHODS

The present work was developed in the Stream Santo Antonio watershed, located in the municipal district of São Manuel, with an area of 4286.15ha, and his geographical situation is defined by the coordinates: Latitude 22° 3' 52" to 22° 38' 20" S and Longitudes 48° 33' 40" to 48° 38' 47" WGr.

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The georeference process consisted of the coordinates of the points of screen control be identified and topographical charts. With these information a correspondence file was generated by the module Dates Entry/Edit, through the module Reformat/Resample.

The colored composition was elaborated with the combination of the 3 bands of sensor Thematic Mapper of LANDSAT - 5, of the orbit 220, point 76, quadrant A, passage of 2009, scale 1:50000. To proceed, the georeferencing of the composition was accomplished, through the module Reformat/Resample of SIG - IDRISI.

Later, the signatures were created by the module Makesig and the classification supervised by MaxVer method, through the module Maxlike. In the supervised classification, the occupations of the soil were identified and differentiated, some of the other ones for his pattern of ghastry answer.

Soon afterwards, they were suitable the names for each class of soil use, associated to their respective badges, being the classified image and the demonstrative graphics of the space distribution of each soil use with base in these data.

In the digital identification of the objectives, the interpretation keys were used for images (Rocha, 1986) for determination of the use classes.

After the elaboration of the chart of soil use, the areas were certain with the aid of the software SIG - IDRISI, being used of menu Database Query command Area, belonging to the module Analysis, being later certain the percentages of each class.

The permanent preservation areas (PPA's) were defined along the courses of water and around of the nascents of Stream Santo Antonio, where the operation was used Proximity - Buffer of Argis 9.3, that it provided the creation of a buffer of 50m of ray in the areas of the nascents and a buffer of 30m on each side of the drainage along the bed of the stream, with that resulting in the map of PPA's based in the resolution CONAMA n° 303/2002, Art. 3°.

To quantify the types of conflicting, it was accomplished the overlay of the use map and covering of the soil with the map of PPA's , through of the ArcGIS being used the option Analysis Tools of the menu ArcToolbox with the command Intersect.

After the overlay of those maps, the areas of occurrence of the conflicts in agreement with the use classes were identified and properly measured, executing the functions of area calculation, through the tools Calculate Geometry and Field Calculator starting from the table of attributes of the shape. That procedure allowed the delimitation of the areas of classes of soil use, qualifying and quantifying the areas that were contained in the limits of PPA's .

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Esse procedimento permitiu a delimitação das áreas de classes de uso da terra, qualificando e quantificando as áreas que estavam contidas nos limites das PPA's.

3. RESULT AND DISCUSSION

The analysis of the soil use (Figure 2 and Table 1) in the Stream Santo Antonio watershed - São Manuel (SP) it shows that the sugarcane was the culture that occupied most of the area, representing 81%, in other words, 3471.71ha, being the remaining of the area almost totally busy for natural vegetation (12.54%).

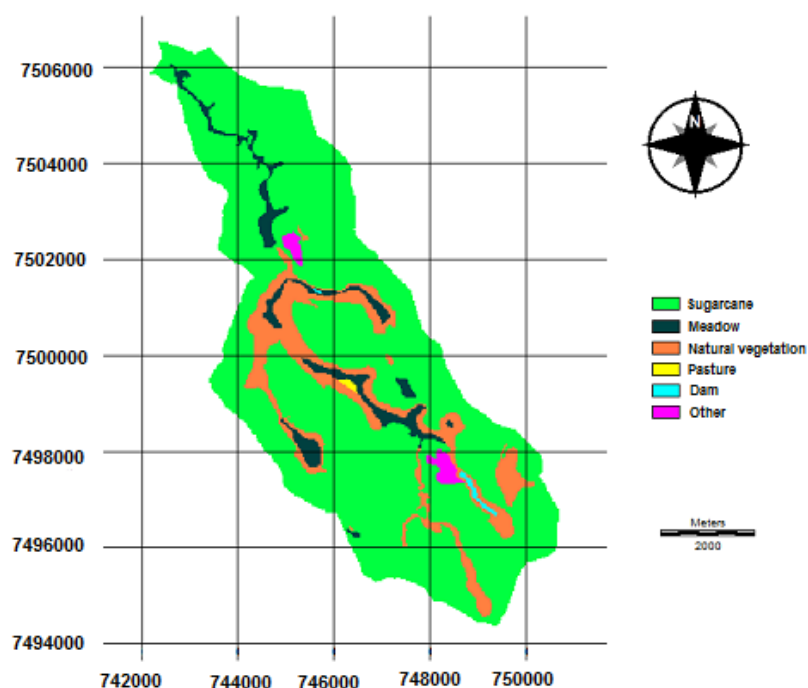


Figura 2. Soil use in the Stream Santo Antonio watershed – São Manel (SP).

In São Manuel region, the areas of natural vegetation with climate and favorable topography, just present tracks of the original vegetable covering, while the savannahs are decreasing progressively for the use of their areas, mainly with cultures of high economical return, as it is the case of the culture of the sugar-cane.

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The Geographical Information System - IDRISI Selva permitted to discriminate, to map and to quantify 6 features in the Stream Santo Antonio watershed - São Manuel - SP (Figure 1): sugar-cane, meadow, natural vegetation, pasture, dam and other.

Table 1. Soil use of the Stream Santo Antonio watershed – São Manel (SP).

Soil use	Watershed	
	ha	%
Sugarcane	3471.71	81.00
Meadow	215.73	5.03
Natural Vegetation	537.66	12.54
Pasture	4.70	0.11
Barragem	10.94	0.26
Other	45.41	1.06
TOTAL	4286.15	100

The obtained data allowed to analyze regarding the environmental preservation of the Stream Santo Antonio watershed that the same is not conserved environmentally, therefore the, of great importance in terms of environmental preservation, represented only 12.54% of the area, and in agreement with the Forest Code, the minimum reservation of forests should be of 20% with arboreal covering of the area of each property. This is a very important parameter, because second Rocha (1991), the forests are essential for the erosion control and of inundations, once they are fundamental in the recharge of the water sheet when located in appropriate places.

After the delimitation of the drainage net, they were established PPA's, that they correspond to 66.66ha is (3.88%) of the whole area of the watershed.

The Figure 3 e Table 2 display the areas of conflict of that watershed, where a great part of the permanent preservation areas (79.63ha) they are being used for other ends, as: 29.46% with sugar-cane, 1.59% with pasture and 1.01% with other elements. Of the remaining of the area, 1.79% have been used with dam, and 66.15% has been preserved with natural vegetation (30.97%) and meadow (35.18%).

The satellite image and the use of the information system were very important tools in the process, in function of the easiness and speed for the mapping of the units of landscape,

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allowing the elaboration of digital maps and supplying reliable results in a small interval of time.

The results will aid in the futures recovery plannings and arranging of the area, because they made possible the verification that the area of the watershed is being preserved environmentally, therefore he comes covered with 24.31% of forests, and the minimum demanded by the legislation of the Brazilian Forest Code effective is of 20%.

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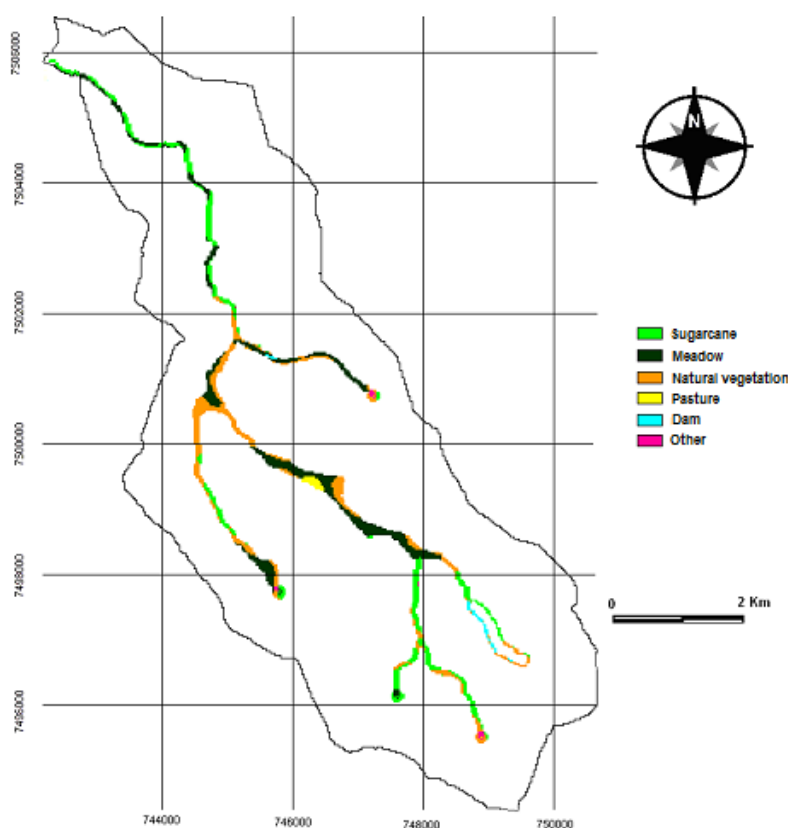


Figure 3. Soil use of the PPAsin the Stream Santo Antonio watershed – São Manuel (SP).

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Table 2. Soil use of the PPAs in the Stream Santo Antonio watershed – São Manuel (SP).

Soil use	PPAs		Conflicts	
	ha	%	ha	%
Sugarcane	73.17	29.46	73.17	87.04
Meadow	87.38	35.18		
Natural Vegetation	76.92	30.97		
Pasture	3.94	1.59	3.94	4.69
Dam	4.43	1.78	4.43	5.27
Other	2.52	1.02	2.52	3.00
TOTAL	248.36	100	84.06	100

4. CONCLUSIONS

The satellite image and the use of the systems of geographical information were important tools in function of the easiness and speed for the mapping of the units of landscape. The obtained results will aid in the futures recovery plannings and arranging of the area, because they made possible the verification that the area has been preserved partially, therefore hehe comes covered with only 12,54% of natural vegetation, and the minimum demanded by the legislation of the Brazilian Forest Code effective is of 20%. The high index of occupation of the soil for the culture of the sugarcane (81%) it reflects the predominance of the agricultural occupation in the area. The area of permanent preservation possesses 248,36ha, of which 29.46% are being busy inadequately for sugarcane.

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