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Technical Note

Impacts on the environmental landscape caused by alterations in the new Forest Code

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Abstract

With the adoption of Law number 12.651 in the new Forest Code, some alterations caused great discussion among environmentalists and farmers, some more impactful than others, but all somewhat important. The present study sought to assess the environmental impact caused in an area of approximately 5 thousand hectares, considering only the point where the New Forest Code considers valid the reckoning of Permanent Preservation Areas of Legal Reserve. The value found in this study shows the great impact that this point of the new law could cause at medium and long term on areas of legal reserve, impacting the local landscape. We also emphasize that, considering or not the PPAs in the sum of legal reserve areas, the area in study is far from the required adequate values, regarding environmental matters required by law, which generally occurs in rural areas, indicating the lack of supervision by the competent bodies. As a tool for this study, we used geoprocessing techniques for the assembling of the photographic mosaic and scaling of the aerial images.

Keywords: New Forest Code, Geoprocessing, Legal Reserve and Permanent Preservation Areas.

Impactos en la paisaje ambiental causados por cambios en el nuevo código forestal

Resumen

Con la adopción de la Ley Nº 12.651 del nuevo Código Forestal algunos cambios han ocasionado haber causado un gran debate entre los ambientalistas y los grandes agricultores, entre ellos algunos más impactantes que otros, pero todos ellos con su importancia. El siguiente estudio trató de evaluar el impacto ambiental ocasionado por un área de aproximadamente 5.000 hectáreas, considerando sólo el punto en que el nuevo Código Forestal considera como válido el cómputo de las áreas de preservación permanente en las Áreas de Reserva Legal. El valor encontrado en este estudio muestra el gran impacto que este punto de la nueva ley puede causar en el medio y largo plazo en las áreas de Reserva Legal con impacto sobre el paisaje ambiental local, hay que señalar también teniendo en cuentao nó las APPs en la suma de las áreas de Reserva Legal, el área de estudio está muy lejos de las cantidades necesarias para estar adecuada a las cuestiones ambientales requeridos por ley, lo que ocurre en general en las zonas rurales, lo que indica la falta de supervisión por parte de los órganos competentes en este caso. Como herramienta para este estudio se utilizó técnicas de SIG para el montaje del mosaico fotográfico y escalonamiento de las imágenes aéreas.

Palabras clave: Nuevo Código Forestal, SIG, la Reserva Legal, Áreas de Preservación Permanente.

Impactos na paisagem ambiental causadas por alterações do novo código florestal

Resumo

Com a adoção da Lei nº 12.651 do novo Código Florestal têm causado algumas mudanças causaram um grande debate entre ambientalistas e grandes agricultores, incluindo alguns mais chocante do que

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outros, mas todos com a sua importância. O presente estudo procurou avaliar o impacto ambiental causado por uma área de aproximadamente 5.000 hectares, considerando-se apenas o ponto onde o novo Código Florestal considera como válido o cálculo de áreas de preservação permanente nas áreas de Reserva Legal. O valor encontrado neste estudo mostra o grande impacto que este ponto da nova lei pode resultar no médio e longo prazo nas áreas de Reserva Legal com impacto ambiental na paisagem local, deve-se notar também não levando em Aplicativos acountor a soma das áreas de Reserva Legal, área de estudo está longe de os montantes necessários para ser adaptada às questões ambientais exigidas por lei, o que geralmente ocorre em áreas rurais, indicando uma falta de supervisão os organismos competentes neste caso. Como uma ferramenta para este estudo foi utilizado técnicas de geoprocessamento para a montagem do mosaico fotográfico e escalonamento das imagens aéreas.

Palavras chave: Novo Código Florestal, SIG, as Áreas de Reserva Legal preservação permanente.

Introduction

Aiming the preservation and conservation of natural mean and, thus, a harmony and equilibrium with mankind, the Brazilian Forest Code was created.

According to FAYAD (2010), the legislation, in order to watch over the environment, had its origin in a period in which Brazil was still a colony, for instance, the denotation of crime for cutting fruit trees. Later, in Imperial Brazil, it stood out the figure of José Bonifácio and the concern about the soil, until the law revolution, in 1934, when it was created the first Brazilian Forest Code.

According to the decree number 23,793, during Getúlio Vargas administration, the Forest Code was approved, revoked in 1965 by law number 4,771, which instituted the New Forest Code; this one, though, was also revoked by the recent law 12,651 of 2012.

Currently, the Brazilian Forest Code is ruled by Law number 12,651 of May 25th of 2012, which opens its text with the definition that the forests in the national territory and the other forms of native vegetation, acknowledged by their importance to the land they cover, are goods of common interest for all inhabitants of the country, exercising the property rights with the limitations that the general legislation, and especially this law, establishes.

The Forest Code, among other things, has some definitions. It characterizes the Permanent Preservation Areas (PPA) as protected areas, covered or not by native vegetation, with the environmental purpose of not only preserving the water resources, the landscape, the geological stability and biodiversity, but also ease the gene flow of fauna and flora, protecting the soil and assuring the well being of human population.

Still in the new Forest Code, in function of better understanding the Permanent Preservation Areas, "spring" is defined as a natural upwelling from the groundwater that is perennial and initiates a water course.

In article 3, paragraph III, the code cites Legal Reserve (LR) as an area located in the interior of a property or rural possession, with the aim of assuring the economical use of natural resources in a sustainable way, assisting on the conservation and rehabilitation of ecological processes, promoting the conservation of the biodiversity, as well as the housing and protection of the wildlife and native flora.

The current Forest Code stipulates a series of minimum widths for protection areas throughout water courses, reservoirs and springs. However, the lowest width in force today is 30 meters on each side of rivers and water courses.

Much can be said about these areas destined for the PPAs; some authors see these areas improper for most plant and vertebrate species. The zone of a minimum of 30 meters beside water courses is generally not sufficient for assuring the biodiversity maintenance and promoting the landscape connectivity at the long run (METZGER 2010).

Delimitation of Permanent Preservation Areas (APPs).

In 2012, with the new Forest Code, the areas around waterholes and/or springs remained with a APP of 50 meters around, however, it was established, according to Article 4, Law 12,651:

I – the marginal zones of any natural water course, perennial and intermittent, excluded the ephemeral, from the edge of the river channel regular waterbed, a minimum width of:

a) 30 (thirty) meters, for water courses with less than 10 meters width;

b) 50 (fifty) meters, for water courses with 10 (ten) to 50 (fifty) meters width;

c) 100 (one hundred) meters, for water courses with 50 (fifty) to 200 (two hundred) meters width;

d) 200 (two hundred) meters, for water courses with 200 (two hundred) to 600 (six hundred) meters width;

e) 500 (five hundred) meters, for water courses with width superior to 600 (six hundred) meters;

Areas of native vegetation protected as LRs are fundamental for complementing the Conservation Units in their role of preserving the Brazilian diversity, allowing large animals to move between great fragments of native vegetation through ecological corridors, and creating landscapes altered by men that can, in great scale, decrease the isolation of great Conservation Units (RIBEIRO 2009).

Delimitation of Legal Reserves

Article 12: All rural property must maintain an area with native vegetal coverage, entitled as Legal Reserve, without damage of the rule application over the Permanent Preservation Areas, if found the following minimum percentages in relation to the property area:

I – located in the Legal Amazon:

a) 80% (eighty percent), for properties located in forest areas;

b) 35% (thirty-five percent), for properties located in Cerrado area;

c) 20% (twenty percent), for properties located in areas of Campos Gerais;

II – located in other regions of the country: 20% (twenty percent).

Another impacting factor that occurred due to the changes in the new Forest Code was in relation to article 15 of Chapter IV, which describes the following: "It will be allowed the reckoning of Permanent Preservation Areas in the percentage calculation of the Legal Reserve of the property".

Geoprocessing Use and Techniques

The use of geoprocessing for this study is based on the use of coordinates collected by a GPS signal receiver and the use of scaling techniques with aerial images obtained by Google Earth software.

The GPS is a positioning system based in data provided by satellites operated by the Department of Defense (DoD) of the U.S.A. The satellites in operation provide information about the position and hour 24 hours a day, at any time worldwide (VETTORAZZI, 1994).

When we talk about the GPS, we cannot forget to mention that, similar to the GPS, there is the GLONASS (Global Navigation Satellite System), which was conceived in order to provide positioning and speed, just as in the GPS, as well as weather information, under whatever climate conditions, at local, regional and global level. This system was also conceived in the early 70s, in former USSR, by the Soviet Union's Scientific Production Association of Applied Mechanics) and it is currently developed and operated by the Russian Federation Space Forces. Similarly to the GPS, the GLONASS is a military system, but there were several government statements offering the system to civilian use (MONICO, 2008).

The GPS system has proved, over the past few years, that it is an effective technique of positioning, providing the obtaining of precise coordinates, mainly the geographical coordinates of latitude and longitude (SEGANTINI, 1999).

The relief characterization in a micro basin is the fundamental basis for the design of sustainable management of the soil in areas with similar characteristics.

According to SANTOS (2002), the knowledge of the landscape heterogeneity is also important for developing schemes of soil samples and defining handling practices. The systems of geographical information (SIG) demonstrate its viability for this type of environmental studies.

To ALMEIDA (1994), data models are representations that generalize and simplify objects and their interactions from the real world, incorporating the concepts of generalization and simplification to the modeling.

The most common sources of samples of land digital models are: digital files imported from other systems, topographic bases with isolines and notable points of maximum and minimum, and field surveys transformed in some way in digital information.

According to PEZZOTI et al (1995), the three basic geographic elements are represented in the following vectorial form:

Point; objects in the land that can be positioned by a single coordinate pair (x,y);

Line; objects in the land of linear extension that, in order to be represented, need at least two coordinate points (x, y);

Polygon; objects in the land that are represented by a set of coordinate points, distributed in a way of delimiting the region.

The polygon is formed by a closed chain

of line segments, being able or not to have other polygons built-in in its interior.

For the collecting of aerial images we used the Google Earth software, which is a computer program developed and distributed by the american company Google, whose function is to present a three-dimensional model of the terrestrial globe, built from the mosaic of satellite images obtained from various sources, aerial images (photographed from aircrafts) and Systems of Geographic Information (SIG).

Material and Methods

Studied Area

The studied area, as seen in Figure 1, is located between the cities of Assis and Paraguaçu Paulista, in São Paulo State, approximately 15 km from the downtown of Assis city, having its central position defined by the rectangular plane coordinates, UTM system at the axis X = 546525.2393m and at the axis Y = 7505604.2543m, with average altitude of 560 meters, and adopted as Datum the SIRGAS 2000.

Equipment and software used

GPS receiver PATHFINDER TRIMBLE, model PRO XR, carrier L1 and code C/A, 12 channels. Data collector RECON.

TopoEVN fácil 6.0 CAD.

Autodesk Map 2013.

GPS Pathfinder Office 3.0.

Google Earth.

Data collection and numerical modeling of the surface

For the collection of the sampled data in field we used a topographic GPS receiver. Moving inside the area kinematically, it collected position data every 5 seconds during its displacement through the area, where the receiver operator moved through the

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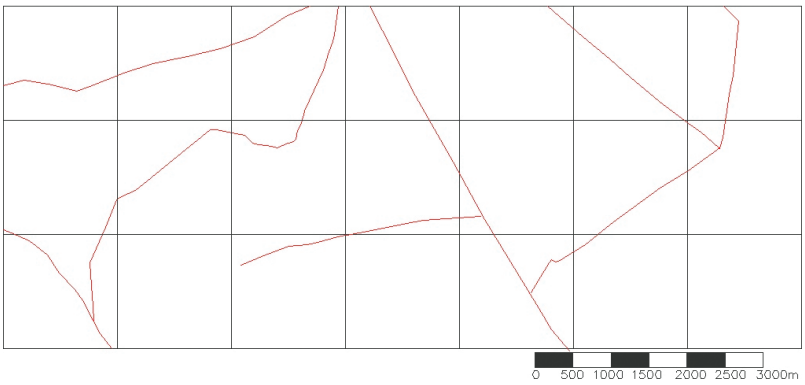
The studied area can be seen in Figure 1 in rectangular form at the central part of the image.

Figure 1. Location of the area.

main roads and towpaths next to the cultures at the local, as we can see in Figure 2. The data collected by GPS served as basis to perform the scaling of the photos acquired through Google Earth and enable the assembling of the photographic mosaic with correct scale and dimensions.

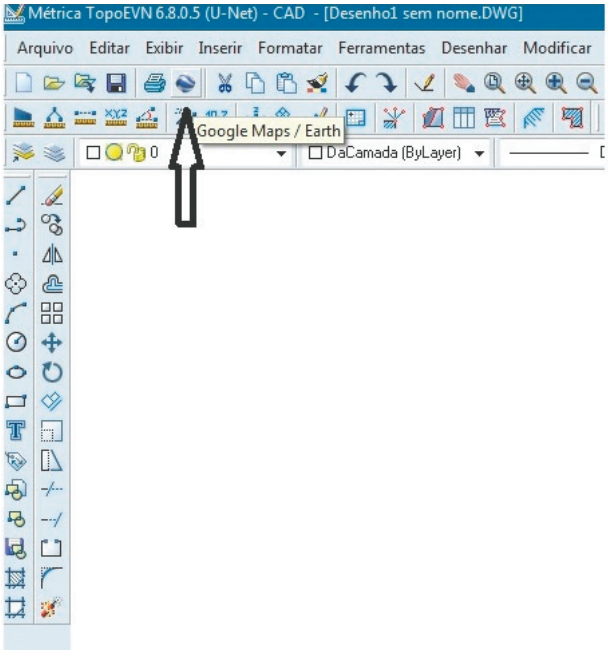
Each point sampled in field, as seen in Figure 2, contains the coordinates X, Y and Z, that is, Latitude, Longitude and Altitude; having this data, we created rectangles of 1500 x 1500 meters, as presented in Figure 2, by the software *TOPOEVN 6.0*.

These rectangles were essential for the obtaining of images from Google Earth, through the command Google Maps/Earth. The command cited is better indicated in Figure 3, which is represented by the screen of the used software.



Observing Figure 2, in red color are presented the lines obtained after the data collection.

Figure 2. Image of the lines collected in field.



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Just as in the assembling of a jigsaw puzzle, the photographic mosaic of the studied area followed the sequence of its assembling, where each photo obtained by the command cited above has its exact location. Figure 4 illustrates how the images were obtained by the software cited.

Figure 3. Command of the Google Maps/Earth Software TOPOEVN.

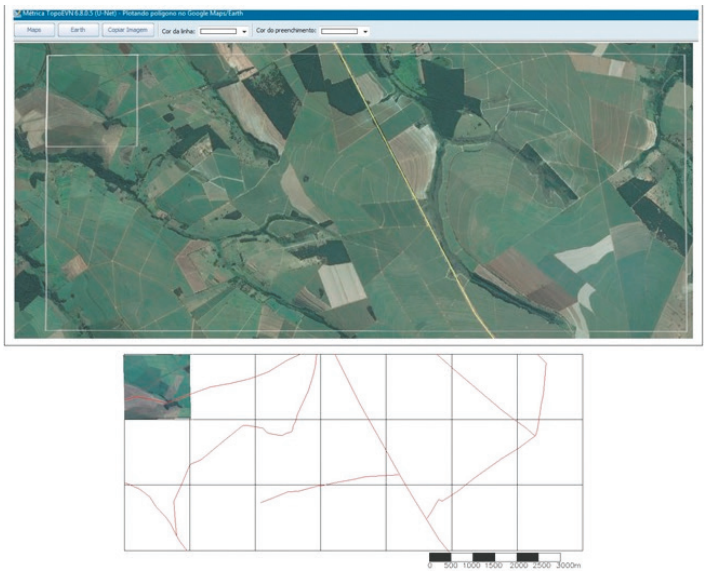

*Figura edited in portuguese by the author.

For the assembling of the mosaic we used the software AutoCAD 2013 Map, with the command of image alignment: <align>, using as reference the common points of the images with the lines collected by the GPS. These common points normally refer to vertices of roads or property corners that can be seen both in the field collection and the photographs.

Figure 4. Assembling of the photographic mosaic.

Following, in Figure 6, we can see highlighted the PPAs, LRs and springs found in the regions of the studied area.

Figure 5. Photographic mosaic with aerial photos obtained through Google Earth.

Results and Discussion

After the assembling of the mosaic, we obtained the following image, which, with the correct scale and dimensions, enabled not only the total calculation of the studied area, but also the identification of the APP areas, springs and LRs, as seen in Figure 5.

In Figure 7, we digitalized the APPs, LRs and springs without the overlapping of the aerial images. The studied area represents a surface of 4,725 (four thousand, seven hundred and twenty-five) hectares.

To calculate the areas described above, we divided them into 21 sectors, which are described in Table 1. In each sector we calculated separately the areas of woods and forests, APPs and springs, when

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(Permanent Preservation Areas | Rivers and Springs | Forests and Reserves)

Figure 6. APPs, LR, Rivers and Springs

found in each location, as we can see the example in Figure 8.

In the figure above, the value of 10.61Ha refers to the woods summed to the APP and the value of 9.47Ha is the area correspondent only to the APP. This way, we conducted the calculations for the 21 areas highlighted in Figure 8. These values are found in Table 1.

Below in Table 2, we found values corresponding to the total required by law to a rural property, regarding the Legal Reserve, which is 20% of the total; this area corresponds to 945 hectares. We can also find the summed values of the woods with the APPs, and also the APPs subtracted from the woods.

In possession of the data presented in Table 2, we can observe that when summed the APPs in the LR areas, the studied area has a total of 67.16% of the

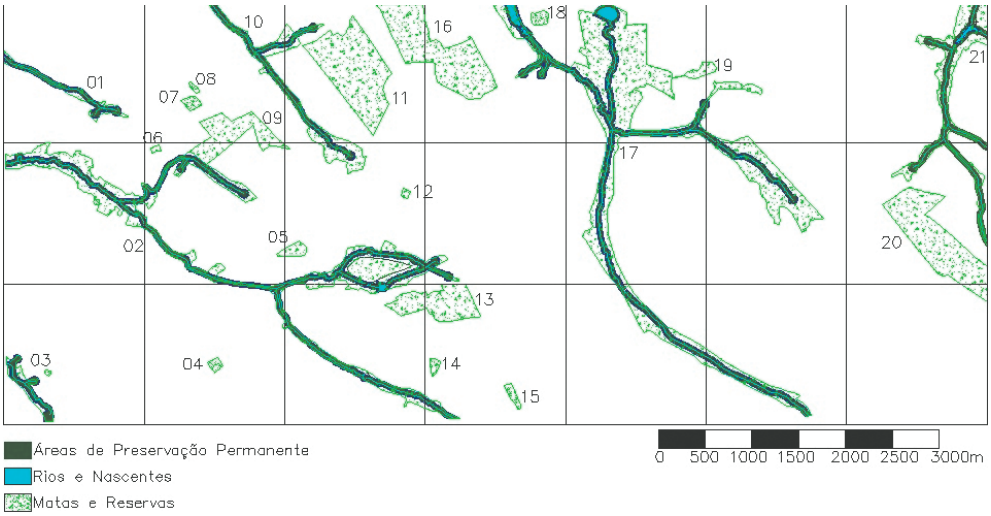

**Figura edited in portuguese by the author.*

(Permanent Preservation Areas | Rivers and Springs | Forests and Reserves)

Figure 7. APPs, LRs and springs digitalized.

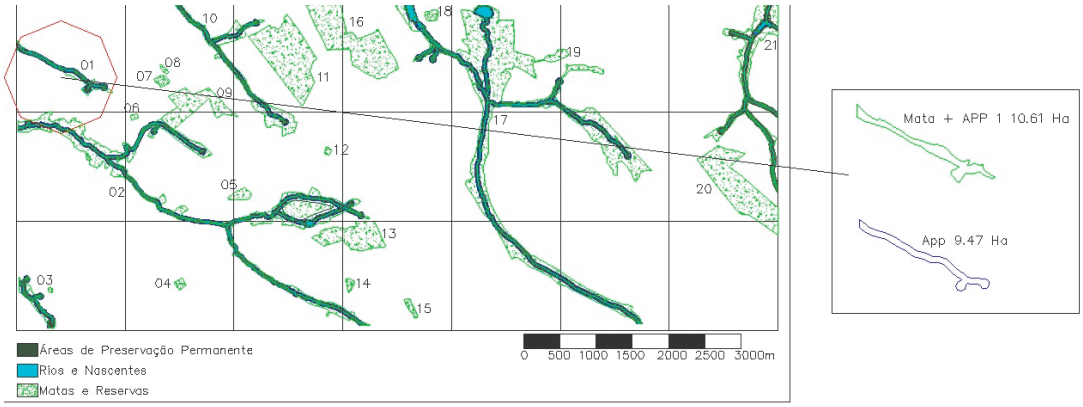

*Figura edited in portuguese by the author.

(Permanent Preservation Areas | Rivers and Springs | Forests and Reserves)

Figure 8. Calculation of the areas of APPs and Woods + APPs separately.

required by law, according to the new Forest Code, considering that the same, in order to be adequate to the new Law, should contain 945 hectares of LR, that is, 20% of the total (4725 hectares). Now, highlighting the same area, but subtracting the PPAs from the LR areas, according to what was in the previous Forest Code, this same area would have only 21.54% of the required by the former law.

Article 15 of Chapter IV of the new Forest Code describes the following: "it will be admitted the reckoning of Permanent Preservation Areas in the percentage calculation of the Legal Reserve

Table 1. Calculation of the areas: APPs, LRs (Woods and Forests).

Areas	WOODS + APP	APP	WOODS – APP
1	10.61	9.47	1.14
2	110.85	72.35	38.5
3	8.57	7.45	1.12
4	1.42	*	1.42
5	3.36	*	3.36
6	0.56	*	0.56
7	2.07	*	2.07
8	0.57	*	0.57
9	23.57	*	23.57
10	28.95	18.44	10.51
11	55.28	*	55.28
12	0.71	*	0.71
13	24.4	*	24.4
14	1.28	*	1.28
15	1.98	*	1.98
16	55.02	*	55.02
17	204.34	68.98	135.36
18	2.25	*	2.25
19	3.19	*	3.19
20	50.88	*	50.88
21	44.82	26.89	17.93
TOTAL	634.68	203.58	431.1

*sectors where there are no APPs.

	TOTAL AREA	LEGAL RESERVE = 20%	WOODS + APP	WOODS–PP
Existent Hectares	4725	945 (required by law)	634.68	203.58
Lacking Hectares	-	-	310.32	741.42
% Existent	-	-	67.16%	21.54%
% Lacking	-	-	32.84%	78.46%

Table 2.Values corresponding to the percentage of the Legal Reserve

of the property". Therefore, the aim of this study was to compare, over the same area, the situations of LR summed to the APPs, and in the same area, subtracting from its total the APPs, as it happened in the former Code.

Conclusion

According to the presented in this study, the reckoning of the APPs in the area of Legal Reserve could bring a considerable loss in areas of woods and forests, and after in the environmental landscape in general, which can be demonstrated above with the data found. Once considered the sum of the PPAs in the Legal Reserve of the studied area, we obtained a total of 634.68 hectares, that is, 67.16% of the required by law, and when not summed, the value found was of 203.58 hectares, representing a total of 21.54% of the necessary: a difference of 431.10 hectares, if deducted the APPs. We reinforce the thought that, although it is only one point of the new Law, the impact caused at medium and long term could bring irreparable losses to the environment, regarding the total areas destined to environmental preservation. Another result we found is a greater concern than just add or not the APPs to the LR areas (as seen in this study): in both situations there is still a disagreement with the environmental laws, not having the minimum required by law when we talk about LR (20%). The methodology employed in this study can serve of basis for the development of new monitoring techniques for areas, in order to adequate them with the environmental matters, since we know the deficiency of the number of professionals and manpower to perform this monitoring and visits *in loco* for conducting the surveillance needed for such questions.

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