

THE CONSERVATION OF SPELEOLOGICAL TOURIST ATTRACTIONS IN THE CENTRAL AMAZON: SITUATION AND PERSPECTIVES FOR THE ENVIRONMENTAL PROTECTION AND TOURIST MANAGEMENT IN THE MAROAGA CAVE

CONSERVAÇÃO DE ATRATIVOS TURÍSTICOS ESPELEOLÓGICOS NA AMAZÔNIA CENTRAL: SITUAÇÃO E PERSPECTIVAS PARA A PROTEÇÃO AMBIENTAL E GESTÃO DO TURISMO NA CAVERNA DO MAROAGA

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Abstract

The conservation of natural tourist attractions, even when considered under a certain regime of special protection or typology of legally protected areas, with the goal of curing the inappropriate use of these areas, needing discussion about the administrative and legal premises regarding its being an effective area. In this context, the actions and perspectives for the protection of the Maroaga Cave, which originated the institution of a state Environmental Protection Area (APA) that takes its denomination in the city of Presidente Figueiredo, AM were discussed in this article. The method of Exploratory Research was used, having been developed from a Case Study, with bibliographic and document investigation. It was concluded that despite the biophysical characteristic of this cavity that makes it possible to include them in the environmental legislation under distinctive typologies of protected areas (Area of Permanent Preservation, Conservation Unit, and Protected Cavity), their official restrictive protection and order for tourist and public use has not yet been secured. This and for the other natural attraction of the APA and the Maroaga Cave depend on their permanent conservation, done through management measures foreseen for the Special Eco-tourist Interest Zone and for the APA Management Plan of Public Use Program, connected to the transformation of its area inclusion in an Integral Protection Conservation Unit and the planning and biophysical of tourism in the location.

Key-Words: Maroaga Cave, Protected Area, Tourism.

Resumo

A conservação de atrativos turísticos naturais, mesmo quando enquadrados sob algum regime de proteção especial ou tipologias de áreas legalmente protegidas, com o objetivo de sanar o uso inadequado desses locais, carecem de discussão sobre as premissas administrativas e legais de sua efetividade. Nesse contexto, as ações e perspectivas para a proteção da Caverna do Maroaga, que originou a instituição de uma Área de Proteção Ambiental (APA) estadual que leva sua denominação, no município de Presidente Figueiredo/AM, foram discutidas neste artigo. Utilizou-se o método da Pesquisa Exploratória desenvolvida a partir de um Estudo de Caso, com investigação bibliográfica e documental. Concluiu-se que apesar da característica biofísica da referida cavidade possibilitar seu enquadramento pela legislação ambiental sob a forma de distintas tipologias de áreas protegidas (Área de Preservação Permanente, Unidade de Conservação, Cavidade Protegida), ainda não estão garantindo sua proteção oficial restritiva e ordenamento de turismo e uso público. Assim como, para os demais atrativos naturais da APA, a Caverna do Maroaga depende para sua conservação efetiva da execução das medidas de gestão previstas para a Zona Especial de Interesse Ecoturístico e para o Programa de Uso Público do Plano de Gestão da APA, aliada a transformação da sua área de abrangência em uma Unidade de Conservação de Proteção Integral e o planejamento e ordenamento biofísico do turismo no local.

Palavras-Chave: Caverna do Maroaga, Áreas Protegidas, Turismo.

1. INTRODUCTION

The official policy of protection/conservation of natural areas in Brazil is connected to distinctive administrative ladders performance (city, state, and national); the specific and complementary laws (Forest Code, National System of Conservation Units, among others); different typologies and categories of protected areas, being able to put itself or complement (MORSELHO, 2001; MEDEIROS *et al.*, 2004; MEDEIROS & GARAY, 2005; BENSUSAN, 2006).

According to MEDEIROS *et al.* (2004), the conception of a system integrated to the creation and management of protected natural Brazilian areas resulted in a model composed of only two separate typologies of spaces destined toward the protection of natural recourses:

a) the protected areas territorially demarcated, with well-defined dynamics of use and management and generically called the Conservation Units (UC); making part of the National Nature Conservation Units System (SNUC – Statute 995/00);

b) spaces protected by legal means and through its attributes and services, above all ecologic ones, but without a previous territorial marking, as happened in the later, to which the Permanent Preservation Areas (APP) and Legal Reservation (RL) – included in the second version of the Forest Code of 1965 (Statute 4771/65).

Besides these typologies cited above, the Underground Cavities are highlighted, whose jurisdiction are currently in the reform, discussion and controversial process.

In this context under effective management for the conservation of natural areas, the UC's are acknowledgeably the most efficient form of guaranteeing the preservation of the natural resources and biological diversity (MORSELLO, 2001; BENSUSAN, 2006), highlighting other typologies of protected Brazilian areas for having the most possible acknowledgement and visibility (MEDEIROS & GARAY, 2005). However, to gain success, they must fill the requirements in their stages of creation and be managed effectively (MORSELHO, 2001), in order to reach the goals for which they were created (BENSUSAN, 2006). The simple creation or implementation of a UC does not supply sufficient elements to effectively guarantee the maintenance of this biodiversity (MORSELLO, 2001; BENSUSAN, 2006).

The natural and/or wild areas can be thought of as the physical or geographical space where characteristic elements and/or autochthonous species

are found. Opposing the concept of urban areas, SILVA (1996), they are defined as virgin, destroyed, altered, abandoned, or marginal lands, used for urban, industrial, or agricultural means, being able to be forests, mountains, deserts, or marshes. They could yield benefits to men (resources and environmental services) if they are conserved to a more or less degree, restoring its original wild composition when they are in degraded areas or if they suffer the presence of exotic species.

As such, environmental sustainability is connected to perception, understanding, and respecting of development of processes that add value to nature and human beings, related to the capacity of a process or form of acquiring natural resources to continue to exist for a long period of time. However, in order for this to happen, it's necessary to identify, characterize, and propose ways of use and access to these resources, by means of elaborating and applying public policy and managerial norms. In this case, the UC were highlighted.

The UC creation, implementation, and management process in Brazil follows the procedures placed forth by Statue 9985 of July 18, 200, which instituted the National System of Natural Conservation Units (SNUC) together with their regulatory executive orders, resulting in the directives and mechanisms that align management and criteria definition for putting these spaces to practical use. According to SNUC, the state of Amazonas instituted the State National Conservation Unit System (SEUC), under Statute no. 53 of June 5, 2007.

The Maroaga Cave—this research's focus—is situated in a state Environmental Protection Area (UC of sustainable use) with the same name. This UC was founded by state executive order no. 99556 of 10/01/1990, the goal of its creation being to protect the speleological cavities of the city of Presidente Figueiredo, WI, besides protecting the relevant scenic beauties and environmental attributes therein, especially the Maroaga Cave.

Despite the 21 years that have passed since its founding, the APA has not yet received a published and official Management Plan, neither have effective actions for implementation of management measures linked to the Public Use Program for its Ecotourism Special Interest Zone (ZEIE). The Zone is comprised of 47 natural tourist attractions, 22 of them for tourist use and 25 potential areas (ones that had not yet been identified or mapped by 2010 and are totally lacking tourist visits), categorizing them in 16 isolated attractions and 15 natural complexes, detailed here: a) Remapping of ten

1998CPRM/PRIMAZ attractions, three of them having new area increments and the other seven being isolated; b) Mapping seven areas registered by SEMMA/SEMTUR (2004-2007), being five isolated attractions and two other new areas; and c) mapping 30 new attractions in the field, seven of them currently in use and the other 23 potential areas, containing ten natural complexes and four isolated attractions 30 (REIS e TELLO, 2011).

It was detected that over a long period of time that APA did not receive appropriate administrative management, natural tourist attractions were gained spontaneously or by executive order and incorporated into a process of intensified tourist visitation with no control and sparse administration, causing environmental impacts that compromised the ecologic integrity of the locations and, consequently, limited its time use, characterizing the process caused by mass or predatory tourism (REIS e TELLO, 2011). However, without complete management at the APA, as was in the past, the natural tourist attractions resist the absence of environmental control order, and public use.

The Maroaga Cave is an integral part of the ZEIE at APA and is an underground sandstone cavity, legally protected and also an APP *ope legis*. However, as remembered by SESSEGOLO *et al* (2004), the group of existing cavities in the Maroaga Cave is also deprived of protection and disciplinary policy, for which comes forth the creation of an integrally protected UC.

With all this, the article presents the current state of management and use of the Maroaga Cave and the incongruence of the official protection mechanisms adopted for its preservation together with the previous ones justifying the creation of APA that gives its denomination and the state of the art of the planned management actions carried out for the UC in question.

2. MATERIAL AND METHODS

2.1. Area of Study

The Maroaga Cave (AM-002) is located on the sixth kilometer of state highway AM 240 (Balbina District Highway) in the city of Presidente Figueiredo, 111 kilometers away from Manaus, in the state of Amazonas (Fig. 01). Its location can be found on geographic coordinates 02°02'58,7" south latitude and 59°57'22" west longitude, with altitude of 120 meters (SESSEGOLO *et al*. 2004). This cave is registered in the Brazilian Speleological Society as "Maroaga Refuge" Cave. Access to the cave from

Manaus is available by interstate BR174 (Manaus-Cacará), running about 105 km until it meets state highway AM-240 on the right. One can go 6 km along AM-240 up to the entrance of the cave that is duly identified with signs. 500 meters from there, the trail continues to the forest.

The APA Maroaga Cave is about 374,700 hectares, equivalent to 14% of the city of Presidente Figueiredo, AM. The UC is located on the geographical coordinates from 01°11'35" to 02°16'02" south latitude and 59°17'24" to 60°25'12" west longitude Greenwich. Its boundaries are the BR-174 (west) interstate, the Waimiri-Atroari/Roraima (north) Indigenous Reservation, the Balbina Dam Lake (east), the Uatumã River (southern), and the Urubu River (south). It's divided by AM-240 on the south section.

Sandstone rocks in the Trumpet Group Nhamundá Formation are predominant in the Maroaga Cave (Lower to Middle Silurian), recovered by the Lateritic Covers unit (Thirdly), and the Torrent-Flood Deposits (Thirdly/Fourthly). The region is included in the Morph structural Domain of the Sedimentary Basin Plateau of Amazonas, in the context of which the differences of the Recent Flood Plain can be seen, Sandstone Plateau, and Lateritic Plateaus.

The sandstone rocks are notably the sandstone-quartz ones pointed out as deposits of Foreshore and subordinately those related to Shore face deposits (NOGUEIRA *et al*. 1997). They are medium to large granulated sandstone-quartz, being very finely chosen and round, exhibiting parallel-plain stratification with low-angled bases, having their origin linked to the flow and refluxes in a wavy zone, while the trunked part materializes in changes in the group of waves and sediments. The sandstone-quartz related to Shore face are fine to thick granulated ones, showing table-crossed, parallel-plain, solid, and crossed hummocky stratification (NOGUEIRA *et al*. 1997).

According to the diagnosis of AMAZONASTUR/PROECOTUR (2004), the face of the tubular river connections is materialized by huge abrupt vertical to sub-vertical sandstone walls, locally with downward inclinations and the heights can be over 30 meters tall, an approximate figure found from the entrance base of the Maroaga Cave to the top of the wall. The average height is 25 meters. It's above the face where the existing cavity entrances are carved in the Maroaga System. The Maroaga Cave's entrance is oval to semi-elliptic (Fig. 02).

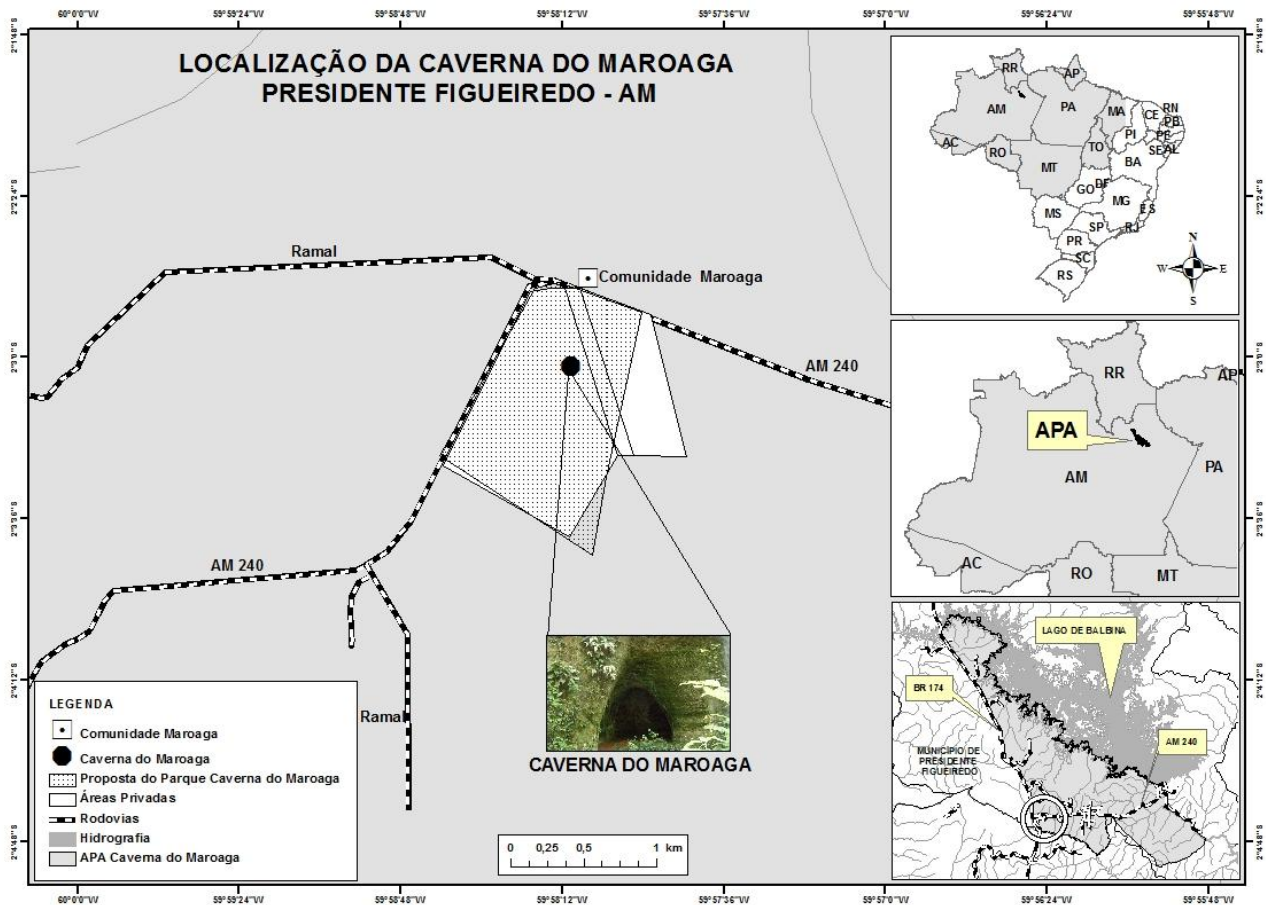


Fig. 01 – Maroaga Cave and its location in relation to the APA. Source: REIS, J.R.L., 2010.



Fig. 02 – Maroaga Cave: a) and b) outer area of the Maroaga Cave – waterfall and a section of its geological structure; c) Identification signs. Sources: MORAIS, Pedro R., 2010.

According to the Köppen classification, the APA climate is the Amw type. In other words, it's a rainy, humid, hot, and tropical climate. The average total volume of precipitation is 2,075 mm. The predominance is formed by recent alluvium plains, lowered peniplains, small steps of "cuestas" and sandstone plateaus. The soils are the type of Garlic-Yellow Latuosoil, Red-Yellow Garlic, and Red-Yellow Podzolic Garlic (IBGE, 1978). In the cave's region, there are Hydro morphological Podzol soils. In the APA there is a certain predominance of Dense Ombrophyle Forest that occupies areas where Paleozoic and Pre-Cambrian, and Low Altitude Forest rocks are dominantly present, located in the

youngest lands of the Quaternary and some plateaus of the Third plain (IBGE, 1978).

In the region of the Maroaga cave, deep fields are predominant and the network of tributary drainage on the left bank is from the Urubu River, composed of courses of Urubuí, Mutum, and Onça water (creeks). The Maroaga and Judea Canals make up the fluvial channels of great interest for the cave, both being first class tributaries (AMAZONASTUR/PROECOTUR, 2004).

In the middle of the APA are 26 rural communities with around 2,193 families (CEUC/SDS, 2011). Among factors potentially responsible for the economic growth of Presidente

Figueiredo observed in the past years are the paving of the BR-174 interstate highway, which makes the largest part of land drainage possible, the mineral jades in the Pitinga region, and the Balbina Hydroelectric Dam and its attached infrastructure.

2.2. Materials

First and second-hand information, like those from letters specifying vegetation, soil, hydrography, public and/or private Conservation Units, agrarian situations, geomorphology, deforestation in the context of Maroaga Cave and APA conservation-priority areas, and reports and bibliographies were obtained.

The following materials and equipment were used:

- Cartographic database (IPAAM/SIPAM) – APA Maroaga Cave. Year 2009;
- ITEAM and INCRA databases – Glebes, private areas and properties.
- TM/Landsat 5 images – 231/61, 230/62, and 230/61 orbit/point and 2009 data. 30-meter space resolution. 0.63-0.69, 0.76-0.90 and 1.55-1.75 spectral bands
- ESRI ArcGIS 9.3 software that was used to elaborate cartographic and space data treatment products.
- GARMIN 3 navigating GPS used to identify geographic coordinates of the area, rural lands, and other relevant environmental aspects;
- Photographic camera and camcorder to film in and around the Maroaga Cave, as well as other aspects necessary in the research.

2.3. Method

The method used was that of exploratory research. This method's goal was to get to know the variable of study that was shown, its meaning and context where it's found, originating in question or problem-forming, with a triple purpose: developing hypotheses, increasing the researchers' familiarity of the environment, fact or phenomena, and clarifying or changing concepts (MARCONE, 2002). In general, case studies (GRESSLER, 2004; YIN, 2005) or bibliographic research (SANTOS, 2005) were used.

Exploratory research involves: a) finding bibliographical material; b) interviewing people who experienced the problem research on a practical

level; and c) analyzing examples that stimulated the understanding of the facts studied.

A case study is an empirical investigation carried out to find out and understand a contemporary phenomenon in its real life context, especially when the boundaries between the phenomenon and the context are not clearly defined (YIN, 2005). Being such, it's characterized by deep and exhaustive study of a single or very few objects in a way that allows the investigation of its broad and detailed knowledge, making distinguishing and detailing the case, data collection, analysis, and data interpretation and report writing possible (GRESSLER, 2004).

The purpose of library or secondary source research is to explain a problem from theoretical references published in documents, those articles of the subject of study made public (MARCONI, 2002). It can be done independently or as part of descriptive or experimental research as well, when done with the intuition of gathering previous information and knowledge about a problem to which one seeks an answer or about a hypothesis that one wishes to experiment (SANTOS, 2005). Bibliographies offer means to define and solve, not only already-known problems, but explore new areas where problems have not yet been sufficiently crystallized (MANZO, 1971 *apud* MARCONI, 2002).

Documental research methods act as an original information source of documents that had not received analyses and syntheses (SANTOS, 2005). The advantages of this kind of research are trustworthiness of the documented sources—essential to any study—the low cost and contact of the researcher with original documents. Among the disadvantages is the lack of objectivity, representation, and document subjectivity.

Obtaining documents and information on the APA Maroaga Cave remained faithful to verifying library collections, whether online or printed in conjunction with its administrating organization and those others that work in the field.

Three technical visits to the Maroaga Cave Field were made, as well as sixty to the APA in order to recognize and note the biophysical and photographic features of the locations. An integrated analysis of the data by means of interactive matrix and control lists was done, according to the methods proposed by SANTOS (2004, in which is the information obtained by primary and secondary surveys through graphs, spreadsheets, or structure diagrams of an interactive template.

3. RESULTS AND DISCUSSION

3.1. The history of the use and occupation of the Maroaga Cave region

The antecedents connected to the use and appropriation of the Maroaga Cave are linked to the beginning of the city of Presidente Figueiredo and to the discovery of the environmental potential of the region with a specific interest in exploitation. The idealization and labor of constructing the interstate highway BR-174 Manaus-Caracará was what sparked the pioneer front that took over the region, threw out and decimated its native dwellers. This contingent was attracted by the region's natural resources and by mass projects in the implantation stage in the 1980's (OLIVEIRA, 2000; BECKER, 2001; REIS, 2010; REIS e TELLO, 2011). In this stage, the exploratory cycle began on various scales of the natural resources (flora and fauna), nudged on by well-articulated parts and with obvious goals of removing environmental goods. This scale is divided in steps.

Initially, intensified exploitation was carried out of noble wood vegetal species until they ran out, in which were informally instituted true businesses that began rural area occupation and exploited it at the same time, which would root the origins of the communities existing today. Parallel to this process is the capture, hunt, and killing off of wild animals, both for trafficking and meat marketing.

As a result of resource stifling, wildlife tamers migrated to other areas, starting the process of clandestine forest exploitation. The people who settled in the land can be divided into two categories:

- In the 1970's, the truly capitalized large entrepreneurs that camouflaged secret wood exploitation by opening pastures for bovine cattle and/or outer fields for large-scale agriculture;
- The unemployed people of big entrepreneurship who had already settled in the city and the adventurers attracted by the "illegal wood industry" in pursuit of an opportunity for a better life. These folks, who had no idea of the financing opportunities nor the proper level of professional training for agriculture trades according to the environmental parameters of the Amazon, (DIEGUES, 1999; FEARNESIDE, 2005; REIS e PINHEIRO, 2010), began and continued to implement a new illegal wood exploitation process, as well as the appearance and constant broadening of new areas and jobs in the region, mainly on the banks of AM-240, the state highway of the Balbina District (OLIVEIRA, 2000; REIS, 2010; REIS e PINHEIRO, 2010);

- After 1990, the pioneer and new inhabitants (very wealthy and learned) are geared back to taking advantage of intensified tourism without any environmental control of the city's natural beauty, originated from the environmental and geomorphologic traits of the area (REIS e TELLO, 2010; REIS e TELLO, 2011).

However, the true interest was sparked thanks to pioneering through the purchase of lengthy areas with the presence of waterfalls and waterslides by entrepreneurs coming from other regions of Brazil (REIS, 2010), who transformed them into credited hotel-touristic businesses, qualified under the means of private reserves under the category of Natural Private Asset Reservations (RPPN), making them a model to follow. This aspect brought forth the interest of rural owners and other local and regional agents and attention migrated to a new way of exploring natural resources—that of public use of waterfalls, caves, and other speleological and geomorphic formations.

Through its discovery, the Maroaga Cave has always been the highlighted and disputed natural attraction, noting acquisition and management by different parties, both public and private having distinct intentions for enjoyment and administration, whether it has been in the President Figueiredo's public and touristic campaigns, from the Amazonas state government itself, or in acts of ownership.

It was exactly like that the Rogério Gribel, an INPA (National Institute of Amazon Research) researcher elaborated the first known proposal to protect the cave in question in the 80's. In the file entitled "Preliminary proposal to create an environmental reserve in the area of the Maroaga Cave Refuge, city of Presidente Figueiredo, state of Amazonas," the environmental and ecological relevance of the region and the degrading environmental scenario done at the time, geared toward the protection of the cavity for means of conservation, research, and education are highlighted.

In this document, GRIBEL (1988) highlights that deforestation done at the time had been catalyzed by government initiatives, such as the creation of the Manaus Duty Free Trade Zone Superintendence's Agro District (SUFRAMA/DAS), substituting the forest for pastures; colonization projects of INCRA, divvying and settling families down on the sides of the highways; constructing neighborhoods adjacent to interstate BR-174 just like the several DAS neighborhoods and a access road to Balbina, among others; and the final construction stages of the Uatumã River dam. Also add onto all those entrepreneurship the uncontrolled

private and land-invading acts of stifling wild vegetal, flora, and fauna. The author emphasizes that up until that time no government measures (neither state nor federal) had been taken to contain the degradation process.

Remembering that creation the conservation units by the government of the state of Amazonas was scientifically based on the report called “Existing and Proposed Conservation Units in the State of Amazonas, with educational, scientific, landscaping, and tourist values” elaborated by INPA researcher Bruce Walker Nelson (NELSON, 1989).

After this, the cited researcher criticized the initiative of the Amazonino Mendes Administration (1987-1990) in an article published as “Flower Inventory in the Amazon and the rational choice of priority areas for conservation” for the said governor having created 9 reservations and parks at the start of the 1990’s (NELSON, 1991).

NELSON (1991) highlighted that the state-created conservation areas were done, but not implanted, being broadly exploited for their publicity worth and that they were chosen mainly on the basis of a simple report (Nelson, 1989) without an appropriate study of the situation of land use at the time and not even having consulted with society prior to the workshop called “Priority areas for conservation in the Amazon,” held in 1990 and without obtaining information consistent with the use of remote censorship.

As a conclusion, greater dialogue and cooperation among INPA researchers, experts, and state government authorities (IMA and SUFRAMA) appeared to be important in the choice and management of such conservation areas.

NELSON (1989) suggests that the location adjacent to the “Maroaga Refuge” Cave should be protected—not only those areas surrounding the cave, but instead an entire transect of the many geological substrates found from the Urubu River (kilometer 104 of BR-174) until the crystalline shield (at km 148), on the reservation border (to be created), established some kilometers east of the highway, far away from the influence of humans. This way, preserving a transect of high fauna and flora heterogeneity within a small area, being important to identify the existence of other caves and deep fields over the same sandstone that probably continued in the southeast direction of the Balbina highway. He highlighted that the caves near the road (BR-174 and AM-240) had already been disfigured, which compromised the fauna.

Biophysical, agrarian, and biological aspects of the Maroaga Cave are reported by Gribel (1988),

who also highlighted important factors to ensure the integrity of this area: agrarian legalization and means for educational and research goals. In this context, he indicates INPA as an institution capable of acquiring and managing it.

Despite this report’s considerations, the state government served NELSON’s suggestions (1989), founding an APA called “Maroaga Cave,” throwing away the interest brought forth by Gribel (1989), mainly due to political instability and agrarian complexity of the time, which still remain around a concrete position about the restrict use of the region ‘til this very day. For an ample number of reasons, it has been a target for a wide variety of arguments and conflicts related to its protection since its creation (IMA-AM, 1993).

The APA Maroaga Cave was initially instituted with an area equal to 2,562 square kilometers. However, in 1994, its dimensions were expanded to 3,747 square km. According to the report written about the APA Maroaga Cave (IMA-AM, 1993) by experts from the Amazonas Institute of Natural Resource and Environmental Protection Development (IMA-AM), Eletronorte had put together a proposal to create a reservation around the Balbina reservoir/Lake to adhere to National Environmental Council (CONAMA) Resolution no. 010/87, called the Biological Reserve (REBIO), instituted by the federal government on the Uatumã River’s right bank. However, it was not possible to create another REBIO on the left bank because the APA Maroaga Cave had already been established.

Overall, the embryonic creation process of the APA Maroaga Cave was lined on:

- Environmental and agrarian organization of the region between BR-174 and the Balbina Reservoir;
- Protection of the region’s speleological formations;
- Focusing on the protection of the Maroaga Cave’s surroundings; and
- Plans, management, and control of tourism in the natural areas of the APA.

To reach this horizons, action plans regarding the APA’s economic-ecological zoning were discussed throughout its existence, as well as elaborated Emergency Management Plans; its Management Plan; and the agreement with Presidente Figueiredo City Hall.

3.1.1. The kinds of official protection adopted for Maroaga Cave

3.1.1.1. State APA

In spite of having been founded twenty years back, the APA Maroaga Cave does not yet have a management plan that would lay out the land use and occupation, would restrict activities contrary to its purposes, would carry out environmental, agrarian organization, as well as natural attraction public use planning and control, highlighting the Maroaga Cave.

Through the Legal Amazon Ecotourism Development Program (PROECOTUR), the Ecosystem Environmental Consulting company won the government contract bids and put forth Speleological Management Plan and Specific Projects on Infrastructure and Signs for the Maroaga Cave (AMAZONASTUR/PROECOTUR, 2004) and a short time later the Speleological Management Plan and Specific Projects on Infrastructure and Signs for the Baptism Cave, located on the outskirts of Balbina (AMAZONASTUR/PROECOTUR, 2005).

3.1.1.2. Permanent Preservation Area

The region of the Maroaga Cave is an APP because its biophysical traits are adept to the criteria described in the New Federal Forest Code: Statute 4,771, of 09/15/1965 and in CONAMA Resolution no. 303, of 03/20/2002, making known:

- Around the start of the water, even if intermittent with a 50 meter line;
- 30 meter distances from the river banks for less than 10-meter-wide water courses (creeks);
- Slopes over 45°, equal to 100% on the line of the most incline.

3.1.1.3. Protected Underground Cavity

The Maroaga Cave is a speleological asset of the state of Amazonas, legally protected by Executive Order no. 99,556, of 10/01/1990 that provides protection of existing natural and underground cavities in Brazil and, according to Section 20, Subsection 10 of the 1988 Federal Constitution, it is property of the Federal Government. As such, it's connected to the Chico Mendes Biodiversity Conservation Institute's National Research and Cave Conservation Center (CECAV/ICMBio), whose goal is to do scientific research and management acts to conserve cave

environments and associated species (CECAV/ICMBio, 2009; CECAV/ICMBio, 2011).

It was discovered in 1983 during the speleological survey work for implanting the Balbina Dam was under way; and was registered in the Brazilian Speleological Society as the Maroaga Refuge Cave (AM-002) (KARMANN, 1986). It has a topographic map made by the ELETRONORTE S.A. topography team and adapted by KARMANN (1986) and complement mapping done by the Environmental Ecosystem Consultants when they did their Speleological Management Plan (AMAZONASTUR/PROECOTUR, 2004). It's considered the largest cave in the state of Amazonas, with 387 meters and the third greatest difference in height (SBE, 2009).

The potentiality of Cave Occurrences in regions made up of sandstone formations is classified as average (CECAV/ICMBio, 2009), a fact which favors the Maroaga Cave according to its exceptionality on a regional level and of High Relevance according to Normative Instruction no. 2, of August 2, 2009, instituting methods for classifying the degree of relevance of underground natural cavities.

3.1.1.4. Park creation proposal

As remembered previously, since the start of the discussion about its official protection in the eighties, the creation of a restricted conservation area geared toward research and education had already been discussed. Anyhow, in 2004 the "Speleological Management Plan and Specific Projects on Infrastructure and Signs for the Maroaga Cave, Presidente Figueiredo, AM," written thanks to the work of PROECOTUR in that city, grabbed public administrators' attention once again, making them aware of the necessity of the creation of a fully integrated conservation unit as a park, preferably a city one, having it in the region where the Maroaga Cave is located, with the purpose of building a touristic infrastructure and avoiding environmental degradation.

The current institutional, technical, and legal discussion about the protection of caves in Brazil could favor full and restrictive conservation for the Maroaga Cave, once the Speleological Management Plan has technical subsidies for relevance and perspective at a regional level in order to environmentally and administratively be organized. Recap that the CECAV is one of approximately 50 places propitious for conservation, depending on studies about the cavities' relevance, use, and occupation in order to identify which protected

area's profile is best appropriate. Among these are those of the Maroaga Cave.

3.1.2. Jurisdiction and current management scenario of the Maroaga Cave

The CEUC/SDS, managing agency of the APA Maroaga Cave, through a Consulting office, is in the planning stages of socioeconomic, biological diagnosis, as well as mapping the use of natural resources, with the objective of making its Management Plan. The APA counts on a Conservation Unit Head placed in the city of Presidente Figueiredo, specifically in the City Environmental Department (SEMMA). However, besides insufficient human resources, there is no infrastructure as vehicles, offices, etc. that can supply demand and carry out immediate management measures for the UC, depending on the availability of the agency's headquarters' resources, located in Manaus. Through Administrative Regulation no. 114/2009, of 06/05/2009, its Deliberating Council was established and holds quarterly meetings after two years without activity.

Inspectorial acts and environmental watch happen daily with the support of SEMMA or through technical visits done by the Amazon Environmental Protection Institute (IPAAM), the agency responsible for environmental supervision in the state UC's. Generally, IPAAM works on monitoring of credited entrepreneurships located in the APA, specifically as a requirement for issuing new Environmental Licenses or for renewing current ones, or when requested by CEUC/SDS to investigate criminal information on local environmental degradation. However, it's worth noting the institutional fragility of the agencies, mainly in regards to the lack of personnel to work as inspectors throughout the state as a whole.

This APA was the first state conservation unit to have a co-management agreement (Contract no. 001/2003 – IPAAM), signed by the administrating agency (IPAAM-CEUC) and Presidente Figueiredo City Hall, in effect from 07/17/2003 to 07/17/2008. Its goal was to share management for means of environmental supervision, inspection, watch and monitoring, professional training and disseminating technology made for sustainable management and community members' natural resources. In any case, the contract agreement was in effect during the alignment of relations between the state and city, as well as for APA management, intending to take action for constituting and forming its managing council. Currently, a new Technical Cooperation

and Support Agreement are being formed in conjunction of local acts.

One of the main factors that makes the APA fragile as far as its actual implantation is the discredit that this conservation unit category suffers upon being granted outside financial resources. No donor or financer believes in its permanence for biodiversity conservational means (PADUA, 2001; REIS, 2010).

Another point is the absence of a public budget whose funds are for the implementation and management of the state conservation units, made evident by the following items:

- Lack of permanent public funds for implantation and management of the conservation units—currently the implementation process and state of Amazonas UC management is runs on the condition of periodic donations from outside resources and there are no permanent public funds. This leaves a fragile institutional environment and shakes up the regulations of Amazonas' SEUC;
- Non-regulated ecosystem values—the initial stimulus to raise the value of environmental services carried out by the state UC's is in the experimental stage and finances over the services are in the stage of speculation and regulation;
- Political mobility of Conservation interests—the acts done on a political level demonstrate the protected area system's fragility since there have not been any institutional establishments from the managing agency (civil service exams, etc.) and UC implantation.

As such, the planned actions for the APA Maroaga Cave management are in progress. However, in light of unique approaches on the evolution of the technical-legislative tools, the APA has a positive consolidate perspective of its Management Plan until the end of the first semester of 2010.

The agrarian regulatory acts are in the initial phase with work by the Amazonas Land Institute (ITEAM) on registering and delivering titles to the communities established in state glebes. In some cases, there should probably be damage payments made to the real owners of those areas occupied by squatters. The occupations located in federal glebes, whether they were grabbed or not, will be covered under the federal "Legal Land" program, in place of carrying out Statute no. 11,952, of June 25, 2009, which establishes provisions about the agrarian regulation of the incident occupation of estates situated on federal land in the Legal Amazon.

One of the key points in the perspective of consolidating the APA's management plan will be the establishment of the Management Programs for the UC, as well as the Income Generation Programs. The Public Use Policy on the existing environments in the APA will be traced in both of these programs through mapping the use of natural resources and defining the UC zones (REIS and FREITAS, 2008).

However, agrarian conflict—mainly those originating from public real estate speculation—is one of the factors that most worry administrators of the protected areas. The case of the APA is no different, even though its creation executive order had highlighted it as a state agrarian asset for environment conservation means, the perimeter of the Maroaga Cave is still enclosed by properties.

According to GRIBEL (1988), at the end of the sixties, and the beginning of the seventies, the extinct Amazonas State Secretary of Rural Production—the agency that had been substituted by the Amazonas Colonization and Land Institute, ITERAM, and currently ITEAM—distributed hundreds of lots of land to people who lived in the southern/south region of the country. These lots were approximately 3,000 hectares each and were located in the basin of the Urubu and Uatumã Rivers. One of these lots is number 106 of glebe "A" from the old city of Itapiranga (Presidente Figueiredo). Its title was written to Mrs. Marisa Lima de Barros on February 16, 1971. The Maroaga Cave is near the south edge of this triangular lot.

The region of the Maroaga Cave is currently under federal domain and is considered an area of agrarian instability because it is neither registered nor on file and cannot be found in any glebe of the federal or state governments. Since it is being disputed in a lawsuit, federal procedure is followed and therefore the land belongs to the federal government until the matter of which jurisdiction should preside over it is solved. The owners of private lands have no legal ownership of estates around the area of the cave and have been living there for over 15 years. Because of this, INCRA is responsible for agrarian regulation, the properties that envelope the attraction, as well as for the entire surrounding community, also called Maroaga, and for detecting the area's control chain and identifying its legitimate owners, that will make rural estate on federal land solutions possible. It will also make use of class or individual petitions if the lands belong to private owners.

In general, the management of the Maroaga Cave is treated under the following aspects:

- The understanding of its importance as a primary target for the city tourist marketing and its vocation for tourist exploration;
- The perception of the lack of decisions on in what administrative sphere its real administrator is, whether it's the federal, state, or municipal government; and in a more specific case if the lot owners are where they currently live or acquired it by purchase.
- The city's pioneering in taking immediate management measures and carrying them out;
- The indecision or absence of protagonist over what planning and future decision perspective should be established to the area for conservationist, practical, or camouflaged means under the approach of tourist exploration.

This is the current management scenario:

- The results of the Speleological Management Plan, which suggested creating a park in the region of the cave, mobilized the three levels of government, receiving more attention from the state and city;
- The tasks suggested came up against the criteria of public possession of the proposed area, excluding private properties, which would result in damage payments land loss;
- Faced with this, public agent stabilized this proposal, betting on differentiated moves. While the state betted on restructuring the APA Council and on task articulation to put together their Management Plan, the city divided area administration into two state secretariats: Tourism (SEMTUR) and Environment (SEMMA).

SEMTUR works with the area tourist administration and coordinating tour guides who take visitors to the cave. SEMMA works with visit monitoring and timely environmental supervisory actions. An important point was the adoption of the measures suggested in the Speleological Management Plan as far as public use goes, such as the quantity of tourists, trail design, and prohibiting access to the inside of the cave.

The tourist activity of the Maroaga Cave counseled by the city does not promote any support to the property owners where the cave is, also being inhibited and coerced to not pursue any form of use geared toward the cave. The owners are people with a elementary level school and professional education. They are farmers who live off perennial plantations and raise small animals to survive (SESSEGOLO *et al.* 2004), but they can also cause

environmental impacts in the attraction (REIS, 2010), mainly as a consequence of deforestation (REIS and PINHEIRO, 2010).

It can be observed that there is no local public authority intervention as far as impeding exploration of the natural attraction for tourism or even inspecting and monitoring the possible impacts by intensified tourism in other areas with the same biophysical traits whose owners are capitalized and possess bargaining power. Another aspect is the large third-party interest in trading land in and around the Maroaga Cave.

SESSEGOLO *et al.* (2004) points out that cave administration run by local dwellers was not making appropriate management possible as far as public service goes, as well as tourist visitation control, especially on commemorative dates. He highlights the fact that administration occurred with an agreement between the city manager and the Maroaga Community President and not between the manager and the region's occupants where the cave is located.

On the other hand, he notes that both state and city officials did not pay attention to technical support to these owners, be it training them professionally and counsel on private reservation care, or even on signing a formal agreement addressing the form of use and most adequate management style to conserve the environment and to enjoy social fairness.

3.1.3. Pressure and threats to the Maroaga Cave

According to GADELHA & ALECRIM (2006), the cave is the most visited one in Presidente Figueiredo, bearing serious degradation risks by speleological formation, containing species threatened with extinction inside, like the mountain cock (*Rupicola rupicola* Linnaeus 1766, Cotingidae).

The vulnerability of the cave increases because of natural phenomenon, such as the intense chemical intemperance, lixiviation, water, ionic, and induced erosions: laminate and in furrows. It's summed up in this, the lack of inspections and maintenance, strong allies to impacting intensification, besides the impacts caused by the flow of visitors. Tourist visits to the Maroaga Cave was done without any control, follow-up, or real supervision whatsoever; only timely events were held in the area. This way, the tourist activity was being conducted in an abnormal way by people who did not have the necessary

qualification to act as guides (GADELHA & ALECRIM, 2006).

The Presidente Figueiredo city Environment Secretariat Administrative Regulation no. 12/2005, from 12/19/2005, prohibits access to the inside of the Maroaga Cave due to the detection of pathogenic fungi that's harmful to human health, originating from bat feces, however it is currently cancelled, calling for the tour guides to let visitors know about access denial.

The Maroaga Cave in within the Expansion Zone of the Presidente Figueiredo city headquarters. In 2006, city Ordinance no. 562 lay out the Presidente Figueiredo Urban and Environmental Developmental Director's Plan and Ordinance 563/06 regulates the urban perimeter and expansion within the city zone, defining 13 disperse urban centers.

The APA Maroaga Cave's geographical boundaries cover the city of Presidente Figueiredo, on the right side of BR-174 on the Manaus-Caracará stretch, containing four urban sections (expansion and urban consolidation).

The advancing of urban expansion flow, accompanied by the consolidation and condensation, could still be advised and planned because there is a bundle of passive urban-forest areas and lots, which would avoid the communities near the city to play the role of catalysts and complement embryo to the expansion flow, whose link happens through neighborhoods built inside the APA and that outline the city headquarters, provided by colonists and squatters in the process of clandestine wood exploitation and in the wrongful appropriation of areas whose geomorphologic characteristics are exceptional. Note that possession and selling of properties right in front of the area surrounding the Cave constantly goes on in the Maroaga Community.

Presidente Figueiredo urban expansion should dispense with identifying areas propitious of lot dividing with the zoning and protection of the permanent preservation areas, the green areas in residential condominiums/legal reservations, and also with creating UC's—whether superimposed or not—over these areas.

According to REIS *et al.* (2008), in 2006, around 8.8% of the APA was deforested (figure 3). The areas that suffered the most deforestation are found along the AM-240 state and BR-174 interstate highways, where most of the APA residents live. Family installations, lots, and deforestation associated with pastures, agriculture, tourist use, burnings, and opening up land were observed in

these locations (MULLER e CARVALHO, 2003). However, one of the main threats is to the environmental integrity of the existing natural tourist resources in the APA.

Clandestine forest exploitation has advanced upon species as the Redwood, Angeline Rock, and other noble rocks. Evidence of this pioneer time period of exploitation is the existence of abandoned neighborhoods currently taken over by the forest's re-growth. According to NELSON (1991), the installed ability for Redwood processing (oil extraction) increased in Manaus in the 1980's with the opening of new roads to the north (referring to the location of Presidente Figueiredo and highways BR-174 and AM-240), penetrating unexplored forests, highlighting that the this specie's exploration happened predatorily.

Most of the deforestation in the region began to implant pastures (IMA-AM, 1993; IPAAM,

1998), but for several reasons, among them economic and management problems, along with many projects of which were not actually implemented and whose areas were abandoned, containing exotic and invasive species, categorizing them as degraded areas where wild vegetation recuperation techniques are not applied.

Currently, an initiative on behalf of the public sector has been the incentive to create private reservations imposed on the conservation unit, but this fact does not guarantee the protection of areas affected by the creation of these reservations. It can be noticed that this factor is an important element to provide more restrictive use protection and a way for the owners to be able to use the land for scientific research and tourist activities. There should also be usage regulation for this situation, with the goal of avoiding environmental degradation.

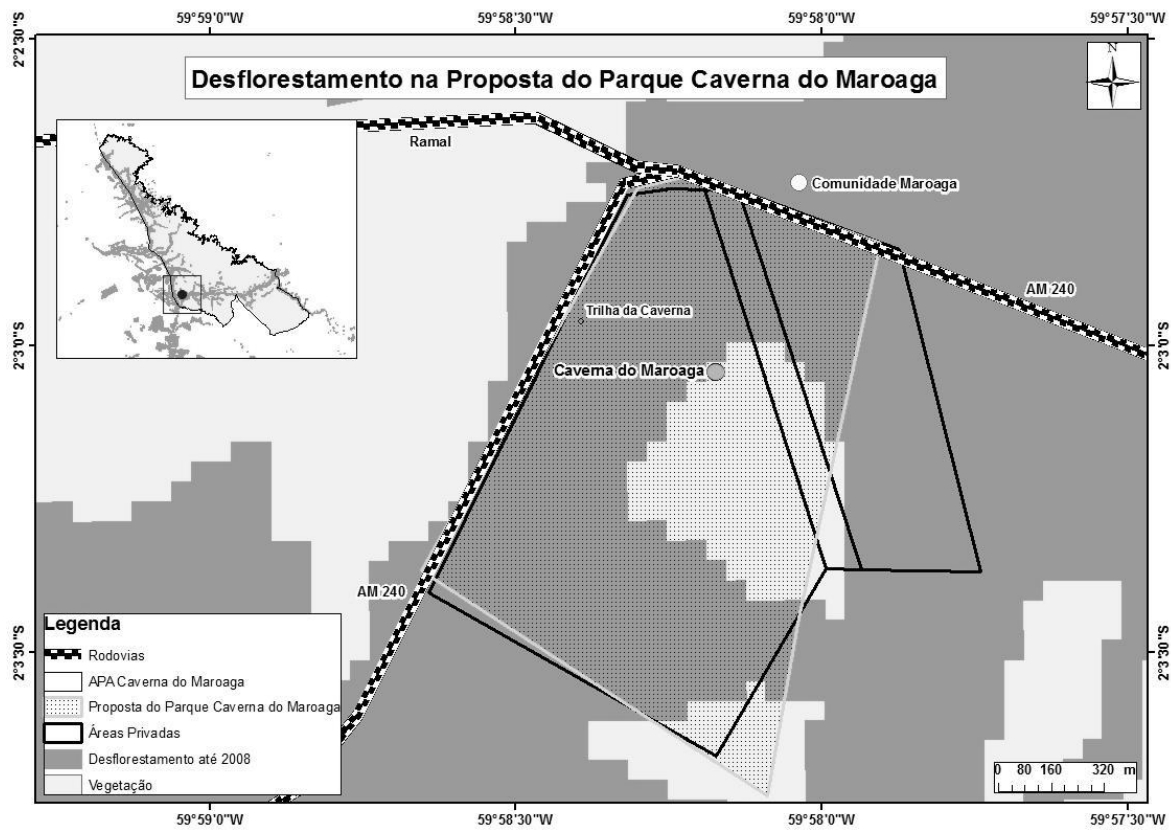


Fig. 03 – Deforestation in the area proposed for creating the Maroaga Cave Park.

3.2. Solutions for efficient protection of the Maroaga Cave

For REIS & FREITAS (2008), the possible solutions for effective conservation of the Maroaga Cave, with an impasse brought on by agrarian and administrative instability, are tied down to negotiations between several public organizations and the owners/squatters of private areas, being up to the following proposals:

- APA zoning to institute the region of the Maroaga Cave as an intangible zone or restricted use area;
- Negotiation between the owners and volunteer private federal or state reservations institution in the region where the cave is located;

- Negotiation and/or legal imposition upon owners to institute legal reservations in the region where the cave is located;
- Instituting the park on a state or city level, indemnifying and/or exchanging lands to the current owners of the private areas on which the proposed land is located.

Implementation of the Management Plan of the APA Maroaga Cave will provide the carrying out of managerial measures foreseen in the Public Use Program for ZEIE. ZEIE was defined by the presence of exceptional natural attributes in use or potentially for tourist activities and those considered fragile and in need of more protection, such as archeological sites and underground cavities. This zone imposes itself over others in this sense and the usage and activities done in it should meet their own norms (MARKSTEIN e REIS, 2011).

ZEIE corresponds to 1.5% (5,710 hectares) of the UC and is formed of three different attraction typologies: a) waterfalls and waterslides; b) underground cavities (caves and flowers); and c) archeological sites. This was temporarily a buffer of 1 kilometer around each attraction, indicating its influence. This area should follow the norms previously defined in the Management Plan and thereafter in the UC Public Use Plan (MARKSTEIN e REIS, 2011).

However, zone boundary creation obeyed the agrarian situation (lands belonging to people are abandoned as pastures or are instead occupied by squatters) of which natural tourist attractions they were incorporated for.

On the other hand, the lack of a Management Plan implementation has made environmental protection action on the region's natural attractions difficult and affects, as has already been explained, the management of the Maroaga Cave. What could be done is make appropriations for social means, such as the public authority creating parks and reservations.

The Method Outline for elaborating the Management Plans for the state UC's of Amazonas (AMAZONAS, 2006), establishes restricted zones for use of natural resources, but applying this criterion in private areas must make functional legislative parameters compatible for area protection, meaning complement use or imposed official protection.

It's worth remembering the APA has an Administrative Norm that establishes disciplinary measures on activities developed in its surroundings which are related to cattle raising, vegetal coverage,

tourism, mining, industry, dividing soil, among others (Norm no. 2 of 05/28/1993 – IMA – AM). Once constitutional boundaries are respected, norms and restrictions can be established to utilize a local private estate located on the APA grounds. However, the norm has no current enforcement.

The Intangible Zone, where reinforced intervention does not result in any sort of influence, is among the zones (AMAZONAS, 2006), scientific research, environmental monitoring, and natural resource protection is permitted, given that means of transportation does not cause impacts or need specific installations for such in small groups. Parallel to this, the Restricted Use zone is of little importance, neither being grave nor dangerous and it adds to recreational activities, environmental interpretation and education, these needing to be done via means of transportation that do not cause impacts or need specific installations for such in small groups

According to SEUC Ordinance, the intangible areas of the sustainable use UC must be computed in the calculation of SEUC's area under a fully protected regime. It also highlights that as a criterion for UC creation and functioning, the sustainable use facilities may be totally or partially transformed in fully protected units by means of administrative regulation from the same hierarchical level that created them, as long as the publicly-known procedures are followed.

In this case, reclassification or re-categorization could happen to this APA regarding dimensions in more restricted UC's, as well as the possibility of realigning its polygon, having the understanding of incoherence in superimposing public UC's from different categories, mainly when protected areas are calculated. The APA could be superimposed, as well as the fully protected units on a city level, National Private Asset Reservations–RPPN—, and Private Sustainable Development Reservations.

It's worth restating that the counterpoints of creating the Maroaga Cave in the region are:

- Lack of ownership of land by squatters on lots they grabbed
- Impossibility of financial investments or institutional-political articulation of squatters, mainly from of the lack of information and qualification;
- Squatter insistence on not selling their lots to third parties. These wealthy and educated people would absolutely transform the region into a

tourist trade and into RPPN's in other areas at the same time.

As a result of this process, another suggestion would be instituting a legal reservation that, according to the New Forest Code of 1965 (Federal Statute 4771/65) and the Provisional Measure no. 2166/67 of 08/24/2001, is 80% of the property to the Amazon biome. However, this measure is only adopted when the necessary procedures are followed for requesting an environmental license for doing any activity impacting the environment for which land ownership is essential, depending on the level of the entrepreneur's influence. In this case, the legal reservation should be recorded in a Real Estate Registry Office, having its descriptive summation and the Complementary Registration signed in the duly qualified environmental agency.

For the Maroaga Cave, this measure is far from being enforced because of the start of agrarian regulation and the lack of action by squatters for attraction usage—that which does not use an environmental license, except those guides qualified by the City who work in the area in the tourist trade. So, licensing private areas would serve third-party interests, but not those of the true occupants.

The misappropriation proposal of the areas in order to build a park has found resistance in the indemnity process, which will trigger what for the state exchequer or the city will not have budgetary plans to back this kind of action up. However, there still is the possibility of having land exchanges, bartering current occupation for another estate chosen by the squatter and donate it for consideration of the public authority. In any case, this decision is linked to the goodwill of the squatter in wanting to accept the proposal. This way, if there is not feasible solution, the public authority should expropriate the property for social means, collective, and environmentally protective means.

4. CONCLUSIONS

One can observe that ordering and monitoring the use of natural resources in areas, whether with or without official protection, is linked to diffuse interests, lacking coordination and political determination to the interests of conserving the biodiversity, which refers to the understanding that these planned and widespread actions are nothing but political speeches for a realistic scenario.

However, such process reflects the fragmentation of the environmental management policies, corresponding and reiterating, on one side,

to the ever-growing specialization of the State machine and to departmentalization of plans, programs, projects, and others that are only finished because of several conflicting demands.

The Maroaga Cave is connected to the institutional articulation process, whether for its real protection or not, and the definition of which means will be adopted for this end, considering possible agreements or understandings to be made among varying public levels in their legal approach and community involvement and participation, serving as a mirror and scenario of the vehicle of the political vision about organizing public usage of natural areas in the Central Amazon.

The factors that made the management of the APA attractions a challenge are the lack of: a) qualification, technical support, and fomentation to landowners; b) studies on supporting qualification; c) visitation control, administration and monitoring; and d) infrastructure and adequate management measures according to the biophysical conditions of each location. Besides this, there are no regulations of public usage that involve environmental licensing, inspection and supervision. This aspects cause the limitation or maximization of time usage of the areas before the advancing of deforestation in the middle of the UC and the express degradation of the APP, making a compact for the continuous spontaneous acquisition and clandestine tourist use of the attractions.

It's pointed out that every natural attraction fits into some typology of legally protected areas, only being able to reassure its real protection through the Integrated Protection Group's UC institution, which are more restrictive than the APA category. Along with this, the public authority's negligence in organizing, regulating, and environmentally managing natural attraction use is the main threat to conserving the natural areas.

Faced with the complicated set-off of proposals for actual conservation of the Maroaga Cave, this area can be highlighted as the prime display of institutional work. Whatever is decided will either serve as the model for official protection of other similar areas distributed by the APA or will be the matrix for what will happen if there are not unified acts between organized civil society and public authorities. Society through demand and popular pressure, suggesting solutions for decision-making about full maintenance of the natural environments of this conservation unit and public authorities enforcing permanent management of environmental assets within their jurisdiction.

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