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RESEARCH ARTICLE

CHARACTERIZATION OF NATURAL RESOURCES FOR CONSERVATION, NUEVA ALBORADA, ITAPUA, PARAGUAY

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Abstract

The objective of the present investigation was to characterize the natural resources within an established area and from the base information, to determine under which category of management these resources could be conserved, because they are constantly being attacked. The research shows the main characteristics of the natural resources of a specific area, established through the Rapid Ecological Assessment methodology. It was carried out in a property owned by the Yacyreta Binational Entity Hydroelectric, built by Paraguay and Argentina on the Parana River, bordering between the two countries. The property is located in the District of Nueva Alborada, Department of Itapua, Republic of Paraguay. The area fully qualifies to be implemented as a "Nature Reserve" area, mainly because it is a transition area between the great wetlands of the southeast and the forested area of the north of Itapua.

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Introduction:-

An increase in the population means an increase in all types of environmental pollution, which will result in an accelerated depletion of natural resources (Owen, 2000). The present investigation characterizes the natural resources within the established area and from the base information, determines under which category of management these resources could be conserved, which are constantly being attacked, such as the extraction of native tree species for wood use, uncontrolled fishing, removal of material - soil, in this case clay for ceramic production material such as bricks, among others. The Rapid Ecological Assessment methodology, known as REA, it is a useful conservation planning tool and used for the rapid characterization of a biodiversity area. The REA are applicable in the efficient characterization of biodiversity at ground level and in species of large areas on which relatively very few is known (Sayre et al., 2000). In this context, studies on the approach to the composition and conservation status of the "Cañada el Carmen" Biodiversity, Boqueron Department in the Paraguayan Chaco, based on the Rapid Ecological Assessment (REA), collected, interpreted and interrelated, at the cabinet and field level, all the scientific and technical information that allowed to determine the creation of the protected wild area (Acevedo et al., 2003). Likewise, other works Guayasamin and Bonaccorso (2011) also with the application of the Rapid Ecological Assessment of Biodiversity carried out in the Tepuyes of the Upper Nangaritza River Basin, Ecuador, with the objective of determining the need for local inhabitants to obtain an official declaration that protects this area from future threats, concluded that collaboration between all those involved is necessary to ensure the conservation of the area, its diversity and the direct (water) or potential (ecotourism) benefits.

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Materials and Methods:-

The investigation was carried out in a property of 1,339 hectares, located in the District of Nueva Alborada, Department of Itapúa, Republic of Paraguay, at a distance of approximately 40 kilometers from Encarnación city. The area studied in its entirety is owned by the Yacyreta Binational Entity from now on EBY, Hydroelectric built by Paraguay and Argentina on the Parana River, which constitutes the natural boundary between both countries. The EBY, formed a 1,600 km² reservoir flooding a large number of islands and continental territory affecting different ecosystems, being one of the causes of the infrastructure change and the environmental impact of the area. Figure 1 shows its location.



Figure 1: Location of the Hydroelectric
Source: EBY.

The first stage of the investigation was to determine the study area and subsequently establish the final surface. The total land area corresponds to the portion of land owned by EBY, adjacent to the Parana River. Figure 2 shows the general location and Figure 3 delimits the study area through topographic work.



Figure 2, 3:- Location Study area in relation to the Encarnación Departmental header and delimitation of the Study Area.

Source: Google Earth

Once the area of study was determined, the methodology for carrying out the research was analyzed, taking into account that there is a few bibliographic information regarding the characteristics of biodiversity in the area.

The method selected was the Rapid Ecological Assessment (REA), developed by The Nature Conservancy, whose first presentation was in 1992 with the Rapid Ecological Assessment material. A manual for users from Latin America and the Caribbean, Preliminary Edition, prepared by Sobrevilla et al. (1992). The Rapid Ecological Assessment (REA) method is used for the rapid generation of information on biodiversity and influencing them in making decisions about the lasting use or conservation of a specific area. An REA of a land area or region is a flexible, accelerated and focused study of vegetation types and species (Sayre et al., 2000).

The work team was made up of professionals from different qualifications, responsible for conducting the REA. Meetings and previous tasks were carried out, such as programming and logistics, identification of the area, plans, satellite images, bibliographic data, among others. Field work was executed on February 22 and 23 and from April 18 to 21, 2017. The results obtained by the mentioned evaluation was relevant information in the analysis and characterization of the area, purpose of study.

The inspection, data collection and field verification were carried out both by land (routes, walks, transects), as well as by river (through a boat), which allowed a review of the entire surface covered by water, in addition, to take a tour of the Parana River from the areas surrounding the research area. Observation tasks were carried out at daytime and at night, in order to detect the presence of animals.

Results and Discussion:-

The study area is located within the Alto Parana Ecoregion, according to the Classification of the Conservation Data Center of the Ministry of Environment (CDC, 2000); globally, it is known as the Atlantic Forest Ecoregion, which forms a complex of ecosystems, forests and basins of the Parana and Paraíba rivers, including forests from the southwest of Brazil, northeastern Argentina and eastern Paraguay, known as “BAAPA” (Atlantic Forest of Alto Parana) or as “Inner Atlantic Forest” (Dinerstein et al., 1995).

The regrowth of the Parana River level, called “Cotas” meters above sea level (masl), for the filling of the Yacyreta dam reservoir, occurred progressively. The area under study was “dry” before and after the dam reservoir was formed, there was a significant change in the ecosystem, giving rise to an extensive and permanent aquatic environment that covered low fields that were only flooded occasionally with floodwaters (low floodplains). In the satellite images of the year 1986 and another of the year 2019, in Figures 4 and 5 this situation can be observed.

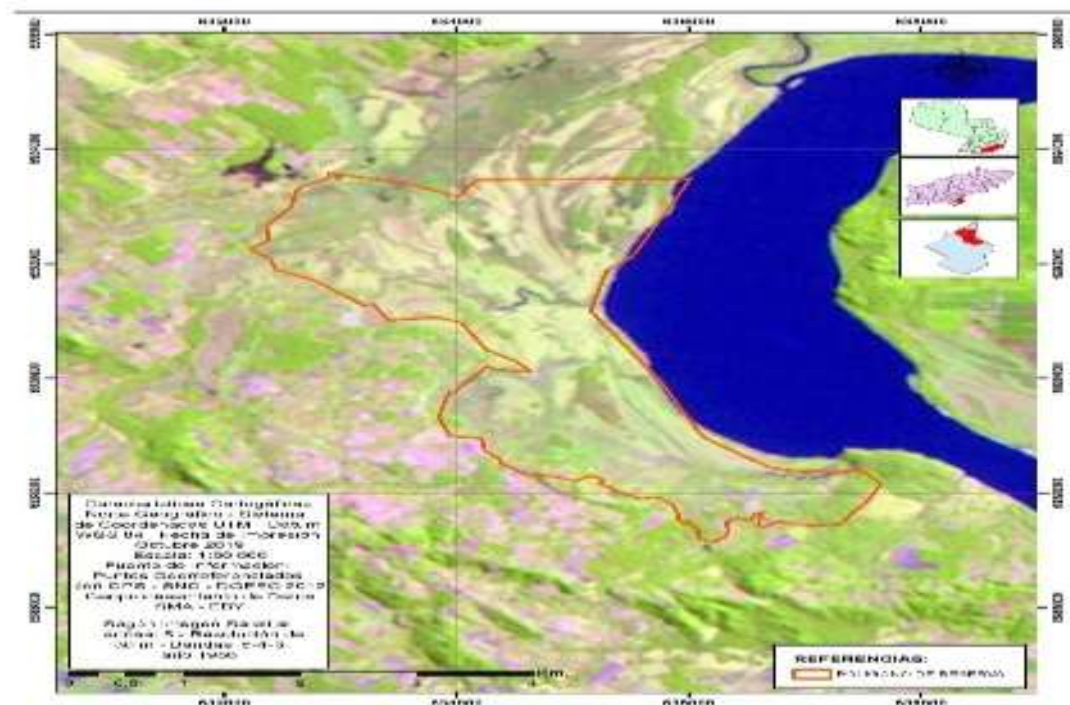




Figure 4, 5:- Land occupation by waters. Source: satellite images Landsat 5 and Sentinel 2, General Directorate of Statistics, Surveys and Census.

This situation is causing a permanent change in the ecosystem, with 43% more permanent water in the study area. In Figure 6, the amount of water currently occupied by the property under study can be visualized.

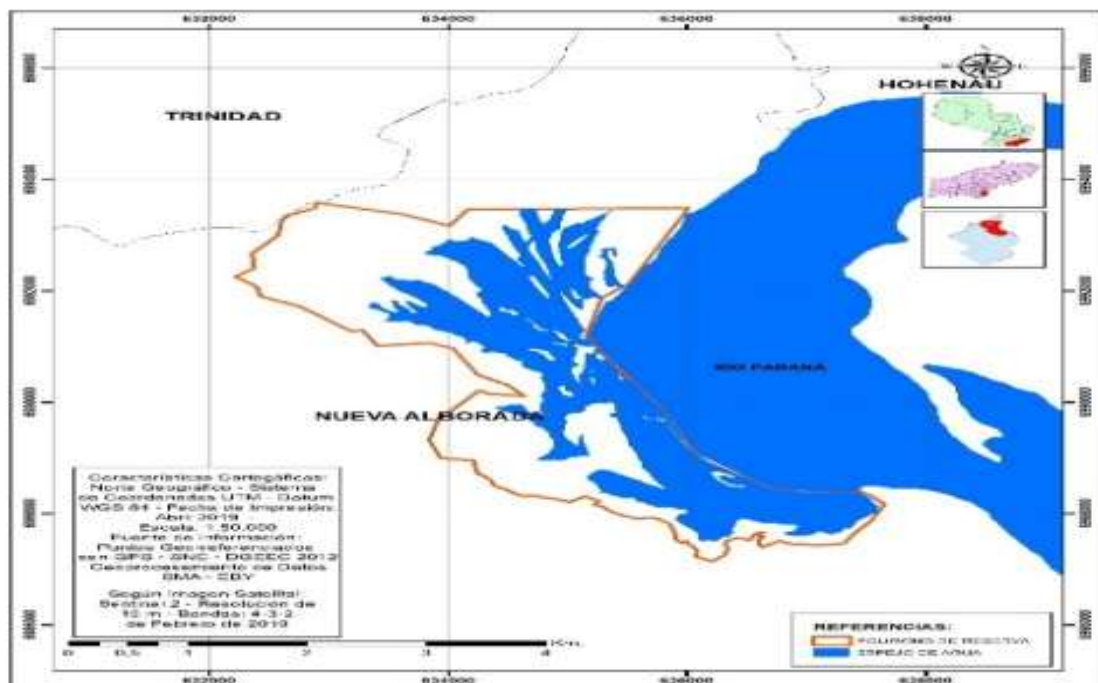


Figure 6:- Flooded area of the reserve.

Source: Image Sentinel 2, General Directorate of Statistics, Surveys and Census.

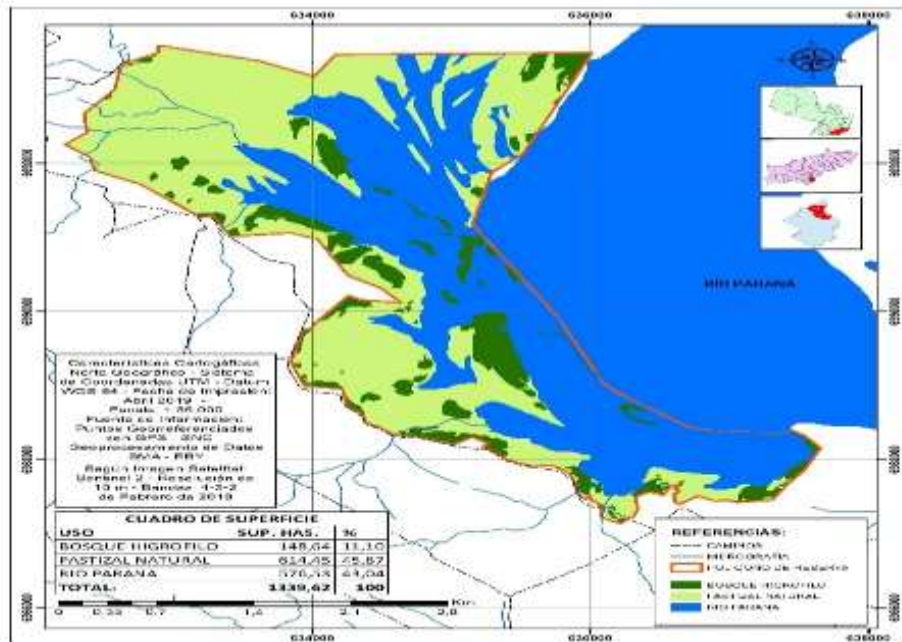


Figure 8: Natural communities in the area of study.

Source: Sentinel 2 Image, General Directorate of Statistics, Surveys and Census.

Hygrophilic forests:

They are forests that develop along the river, in the area of the terrain with greater slope. The forest has little diversity. It has three strata, the upper stratum reaches 12 meters high, the predominant species are *Peltophorum dubium* (yvya pytâ), *Syagrus romanzoffiana* (pindó), *Inga affinis* (inga) and *Trema micrantha* (kurundi'y). In the middle stratum, *Casearia sylvestris* (burro ka'a), *Sebastiania* sp, *Eugenia uniflora* (ñangapiry), *Rollinia emarginata* (aratiku'i), and *Vitex megapotamica* (tarumá) are observed. The lower stratum is composed of several species of ferns, herbaceous and regenerations of woody species. *Croton urucurana* (sangre de drago), and *Cecropia pachystachya* (amba'y) predominate at the edges.

Pastureland:

It has a formation dominated by an herbaceous stratum with mostly marsh species and by some tree heliophyte species. In the herbaceous stratum, species such as *Gamochaeta* sp (viravira), *Lepidium ruderae* (mastuerzo silvestre), *Cynodon dactylon* (kapi'ipe'i), *Solanum sisymbriifolium* (ñuatipyä), *Pfaffia glomerata* (batatilla), *Eryngium elegans* (karaguata 'y), *Chrysolaena cognata* (jagua pety), *Andropogon lateralis* (kapi'i pytâ), *Polygonum punctatum* (ka'atái) and *Schizachyrium condensatum* (aguara ruguái). Among tree and shrub species, *Sapium haematospermum* (kurupika'y), *Acosmium subelegans* and *Casearia sylvestris* (burro ka'a) were recorded.

River:

This natural community corresponds to the Parana River, which houses some species of aquatic plants. The aquatic species found during the tour were: *Egeria najas*, *Sagittaria montevidensis* (saeta de agua), *Eleocharis* sp, *Thalia geniculata* (peguaho), *Nymphoides indica*, *Pontederia cordata* var. *cordata* (aguape) and *Hedychium coronarium* (cañabrava).

Flora:

Species richness is low, 114 species were registered, corresponding to 45 botanical families and 96 genera.

Threatened species are not registered, only one species that has a mild threat category on the red list of the International Union for Conservation of Nature (IUCN), which is the case of *Pterogyne nitens* (yvyrraro), which category at the global level is of lower risk (LR / nt) since there are not enough data to change categories.

Wildlife:**Mastofauna:**

The tours and observations made revealed few species of mastofauna present, totaling 11 species including the European hare (*Lepus europaeus*) that is in a wild state.

In general, it is estimated that the area can potentially contain many more species of mammals than found.

Identification of habitats and species of high conservation value:

There is a possibility that these habitats are suitable for some species associated with these marsh and wet habitats, such as:

1. Carpincho (*Hydrochoerus hydrochaeris*)
2. Karaja (*Alouatta karaya*)

Birdlife:

During the field work 87 species of birds were registered, corresponding to 35 families.

No threatened species has been registered at the global level (IUCN) or at the national level (Secretariat of Environment - SEAM).

Only one species almost threatened worldwide (IUCN: NT) was the Tachurí canela (*Polystictus pectoralis*). This species is threatened by the disappearance of its habitat: natural grasslands, so the management of this habitat is essential for the permanence of this species in the area.

International conventions related to birdlife:

1. CITES: 12 species were found in the CITES II category.
2. Official CMS list: 12 species were also found in the CMS II category.
3. Migratory species Osprey (*Pandion haliaetus*), in category N (Nearctic) according to Castillo and Clay (2004, 2005), a Nearctic migratory species that nests in North America and migrates in South America in summer.
4. Eleven southern migratory species were found in the categories AS, AN and AV according to the same authors.
5. Endemic species: No endemic species of concern have been found, only a single species that is considered endemic to the Atlantic Forest, the green-headed Chiripepe (*Pyrrhura frontalis*) has been found but this is a common species and is also found in others habitat types so it is not relevant.
6. Important Bird Area (IBA): The property is not in any IBA or close to one.

Herpetofauna:

The field work was carried out on April 18-21, 2017. On the first night of departure 6 species of amphibians were registered, corresponding to 3 families and 4 genera. The other days, work continued during the day and night in which 4 more species were registered, corresponding to 2 families and 3 genera.

Two (2) species that are considered endangered at national level were registered (Resol. N ° 2243/06 SEAM). The species identified were: *Limnomedusa macroglosa* and *Hypsiboas curupí*.

Ecological significance:

The studied area, despite the anthropic impacts observed, has ecological significance in the following aspects:

Conservation of a habitat in a natural transition zone: the area contains ecosystems associated with wetlands in transition with the Atlantic forest. These represent the last wetlands at the northeast end of the extensive wetlands of the middle basin of the Parana River (Ñeembucu, Yberá). It is recognized that natural or semi-natural ecotones are important for the maintenance of biodiversity. Despite the process of filling the reservoir, it was observed that not all original ecosystems were lost due to flooding. It was found that these habitats are in the process of migration at higher levels, and highly intervened ecosystems such as rice paddies are in the process of recovery and evolution.

Conservation of grassland birds: The presence of *Polystictus pectoralis* is a clear indicator of the conservation potential of birds associated with this type of ecosystem.

Waterbird conservation: The area contains significant concentrations of waterbird species associated with the Paraná River lagoon system.

Potential for reintroduction of wild species: The area has ecosystems associated with wild wetland species, some of them very threatened such as the aguaraguasu (*Chrysocyon brachyurus*) and the swamp deer (*Blastocerus dichotomus*).

Conclusion:-

It was found that the area under analysis fully qualifies to be implemented as a "Nature Reserve" area, mainly because it is a transition area between the great wetlands of the southeast and the forested area of northern Itapúa, which would achieve conservation of natural resources, which are currently impacted by anthropic action. This formation, although a large part is in a process of secondary succession due to alterations produced by the flooding of the reservoir, is still in a position to maintain and recover much of its previous composition and structure.

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