



ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)

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Date 31.07.2021

Reference N. 109002841-001-0000-E-1500

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PARACEL

EUCALYPTUS PLANTATION

Departments of Concepción and Amambay – Paraguay

VOLUME II – BASELINE CONDITIONS

TOMO II – BIOTIC ENVIRONMENT

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Distribution	
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Orig.	31/07/21 – hbo/kgz	31/07/21 – bvv	31/07/21 – hfw	31/07/21 – hfw	For information
Rev.	Date/Author	Date/Verified	Date/Approved	Date/Authorized	Observacion
a	20/08/21 – hbo/kgz	20/08/21 – bvv	20/08/21 – hfw	20/08/21 – hfw	For information
b	13/10/21 – hbo	13/10/21 – bvv	13/10/21 – hfw	13/10/21 – hfw	For information

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6 BASELINE CONDITIONS

6.1 Biotic Environment

The biodiversity baseline study was developed on the properties of PARACEL company, which plans the construction and operation of a pulp manufacturing plant on the Paraguay River, designed based on the best available technologies, and managed by according to certified systems, both from the productive and socio-environmental point of view¹. The raw material (*Eucalyptus* spp.) will come from own plantations located mainly in Concepción Department and to a lesser extent, in Amambay Department. The plantations will be installed in a total of 19 properties, on areas that currently correspond to livestock use.

The study area is located within the Districts of Sargento José Félix López in Concepción Department and Bella Vista in Amambay Department, around 500 km from the capital city of Asunción, within the northeastern region of the Department of Concepción and belongs to the Aquidabán ecoregion (Res. SEAM N° 614/13). Seven main sampling areas have been identified: Gavilán, Trementina, Soledad, San Liberato, Santa Teresa, Zapallo and Hermosa). The faunistic monitoring has been carried out systematically and according to a specific monitoring plan; the technical team has carried out a general survey, making it possible to create a list of species for the area as a biodiversity baseline. This information is based on a bibliographic compilation for the potential species to be present in the area and direct observations as a result of field sampling.

The study area is located mainly within the Cerrado ecoregion, which is ranked as Highest Priority at Regional Scale for conservation, based on an analytical system for evaluating the conservation status of the ecoregions (Dinerstein et al. 1995). In Paraguay, the Cerrado occupies relatively small discontinuous areas forming a mosaic pattern on a slightly undulating topography with sandy soils generally visible between the vegetation. It should be noted that, depending on the authors and the context, the Cerrado can be classified as an ecoregion, an ecosystem or a formation. For the purpose of this report, the formation of the Cerrado at a national level is classified under different ecoregions, due to the fact that there is no detailed study of its distribution (Marín et al. 1998, Basualdo & Soria 2002, Rolón et al. 2017).

In the case of this study area, the Cerrado converges with the contiguous Humid Chaco and Upper Paraná Atlantic Forest ecoregions resulting in the presence of a high level of characteristic transitional biodiversity of the main taxonomic groups, and which this study focuses on (plants, fish, amphibians, reptiles, birds and mammals), resulting from the interaction between the ecoregions and their convergence. Knowledge is scarce; however, in spite of this limitation, the region is widely recognized as an area of great importance for fauna due to its remarkable diversity, the presence of species that are either endemic or have a restricted distribution, as well as a considerable number of species that fall under one category of threat or another (Rojas et al., 2020; Critical Ecosystem Partnership Fund, 2017; Asociación Guyra Paraguay, 2004). To further this ecoregional complexity, the area is also influenced by wetlands.

The Paraná-Paraguay river and wetland system acts as a corridor for fauna and flora in a predominantly north-south direction, facilitating the dispersal of organisms from

¹ PARACEL. Terms of Reference 200907 PAR-IFC-TOR-BLS biodiversity. Pag. 1

tropical regions to temperate latitudes and from the coastal regions of the Río de la Plata estuary towards the Paraná River and its tributaries (Ringuelet 1975, Giraudo et al. 2004, Arzamendia 2006, Neiff et al. 2006). As a unique characteristic, this region harbors the southernmost distribution of the Cerrado biome, a global diversity hotspot (Myers et al., 2000), reaching into the departments of San Pedro, Canindeyú and Caaguazú in the Eastern region of Paraguay (PNP, 2013; SEAM, 2013).

The study area includes the four types of typical environments found within the Cerrado region; *Bosque Alto* (Tall Forest), *Cerradón*, *Campos Sucios* (Dirty Fields) and *Campos Limpios* (Clean Fields), which have undergone different degrees of alteration mainly as a result of livestock use. Influences from neighboring ecoregions such as the Humid Chaco and the Upper Paraná Atlantic Forest are also evident (Hayes et al. 1995). The presence of Chacoan plant communities is frequently evident by *Copernicia alba* (*karanda'y*) palm groves mixed with typical elements of the Cerrado. Where deeper and more complex soil types are found, tall forests or elements typical of the Upper Paraná Atlantic Forest appear. This mixture of species and landscapes, or rather, this zone of gradual transition results in a local enrichment effect since it creates an opportunity for the convergence and confluence of species that are unique to the individual ecoregions.

Based on the databases from three different sources on the species richness of Paraguay's ichthyofauna, the numbers range from 259 (www.fishbase.org) to 395 (www.faunaparaguay.com/fishlist.html), and up to 451 (www.guyra.org.py). Published studies estimate that there are between 129 (Ramlow, 1981), 189 (Mandelburger et al., 1996) and 298 species (Bertoni, 1939). According to the Koerber & Vera checklist (2017), a total of 307 species of fish were confirmed and listed, four of which are threatened and another four species are introduced exotics. Earlier studies on the ichthyofauna within the study area are scarce and superficial; however, Insaurralde (2012) mentions 37 species for the Aquidabán River, which is relevant considering that the Trementina Stream (*Arroyo Trementina*) is a tributary of this sub-basin. Other water courses of this sub-basin are Negla, Pitanohaga and Napegue. Also, the Hermosa stream was sampled and this flows water northward into the Apa River.

Around 54 species of amphibians and 91 species of reptiles have been recorded within the study area (Brusquetti & Lavilla 2006, Caballero et al. 2016, Cacciali et al. 2016, Cacciali & Kohler 2018; Smith et al. 2012, Weiler et al. 2013), which represent 61% and 50% of the total number of species for each group present in the country, respectively. In Amambay and Concepción, for instance, there are recorded species of anurans that are not found in any other region of the country, such as *Physalaemus centralis*, *P. marmoratus*, *Leptodactylus furnarius*, *Rhinella scitula*, *Dendropsophus jimi*, *D. elianae*, among others, which suggests this area as an endemic center for anurans in Paraguay (Cabral et al. 2020). Furthermore, although it would seem that the reptiles were simply a sub-set of species from the Atlantic Forest (Cacciali & Ubila, 2016), there are also species exclusive to plant formations of the Cerrado region, such as *Norops meridionalis*, *Colobosaura modesta*, *Salvator duseni*, *Bothrops pauloensis*, among others (Cacciali et al. 2016), which gives the area an exclusive conservation relevance.

There are 464 species of birds that occur within the Cerrado area (65% of the national birdlife), of which 11 species are considered endemic to the Cerrado in Paraguay. Furthermore, a number of species of great importance, either as a result of their ecosystemic role or because of their level of threat in Paraguay, occur in the Cerrado

(*Crax fasciolata*, *Pipile cumanensis* g., *Rhea americana*, *Ara chloroptherus*, *Ara ararauna* and *Anodorhynchus hyacinthinus*) (Silva 1997, Guyra Paraguay Sf).

Regarding the mammalian fauna, the study area has few taxonomic studies and systematic surveys throughout the region (Critical Ecosystem Partnership Fund 2017, Red Paraguaya de Conservación en Tierras Privadas, Guyra Paraguay and Conservation International 2008; Guyra Paraguay 2004). Furthermore, most of these surveys were carried out in areas set aside as reserves on private lands, which leaves vast extensions of territory unsurveyed. Some scientific collections exist and some specific scientific work has been carried out where mammal data has been presented for this area (Gamarra de Fox & Martin 1996, Lowen et al. 1996, Melquist 1984); however, most of data compiled on the fauna of the region has resulted from the work carried out during expeditions, casual observations, interviews and Rapid Ecological Assessments for the preparation of technical reports (MAG 1996, Macedo 1996, Altevrida 2003, FMB 2004, NLT 2007, Rojas et al. 2020). Rumbo (2010) lists 66 species for the Cerrado in Paraguay, based exclusively on records published in academic articles and museum specimens.

The Guyra Paraguay Biodiversity Database (BDBGP) lists 96 species for the Cerrado (*Campos Cerrados*); this database also includes historical records, data gathered during rapid ecological assessments as well as unpublished observations, always maintaining a strict approach regarding the inclusion of records. Bearing in mind the convergence of other ecoregions, an extensive review of the knowledge regarding the mammalian fauna of the “Northern Block of the BAAPA (Upper Paraná Atlantic Forest)” carried out by Guyra Paraguay (2004) has been consulted, compiling information from more than 20 studies carried out in the region, including the southern part of the area of interest for this study as well as the northern part of the Humid Chaco in the Western Region of Paraguay. In this review, a list of 115 mammal species was compiled based on reliable records for the study area. Once the lists were combined and the taxonomy of the cited species updated, a list of 103 possible species for the study area was obtained, which represents 57% of the country's species.

In Paraguay, 181 species of mammals have been identified (Sancha et al., 2017), of which 24 species fall under some level of threat category at an international level, while 12 species are considered DD (data deficient) (IUCN, 2021). At a national level, 32 species fall under some level of threat category, 29 are considered with insufficient data and 2 are not evaluated (APM & SEAM, 2017). Among the possible species for this work, some are cited as being of special importance for conservation such as jaguar (*Panthera onca*), giant armadillo (*Priodontes maximus*), giant anteater (*Myrmecophaga tridactyla*), maned wolf (*Chrysocyon brachyurus*), tapir (*Tapirus terrestris*), lipped peccary (*Tayassu pecari*) and pampas deer (*Ozotoceros bezoarticus*). All these species have in common that they are mammals with very specific habitat requirements, are threatened at either a national or international level, are medium or large in size, and can be monitored, using them as "umbrella" or "flag" species to achieve conservation objectives for most of the mammalian communities in the region. In summary, the mammalian fauna of the region is little known, more than 50% of the country's species are listed as possible for the study area, and among these species there are some of special interest for conservation.

6.1.1 Protected Areas (nationally and internationally recognized)

Protected Wild Areas

The legal framework for natural resource conservation within protected areas in Paraguay was established by Law 352 on Protected Wildlife Areas ("Areas Silvestres Protegidas" - ASP in Spanish), approved in 1994, which created the National System of Protected Wildlife Areas of Paraguay (SINASIP) (Sierra et al., 2004).

In 2000, in response to a specific need to implement the subsystem of the private forest areas, three resolutions were enforced: Resolution 49, approving the methodology for the elaboration of Management Plans for Wildlife Areas protected by SINASIP; Resolution n.73, authorizing the National Registry of Protected Wildlife Areas of Paraguay; and Resolution 79, establishing the procedure for the legal creation of private domain protected areas (Sierra et al., 2004).

That same year, Law 1561 created the National Environmental System and the Secretariat of State for the Environment (SEAM), entities whose function or objective is the formulation of policies, coordination, supervision and execution of environmental actions and plans, programs and projects within the framework of the National Development Plan and related to the preservation, conservation, recomposition and management of natural resources (Sierra et al., 2004). According to SINASIP, Paraguay's protected wildlife areas have three management categories:

Fully protection

National parks: Those natural areas with ecosystems that contain outstanding geomorphological features, as well as species representative of a natural region and that under protection are destined for research, education and tourism in nature.

Natural Monuments: Those areas that contain unique natural or cultural characteristics or features of outstanding cultural value and that under protection are intended for scientific research and recreation when conditions permit.

Flexible use

Wildlife Refuge: These are those preferably natural areas intended for the conservation of species and ecosystems through active management.

Protected landscapes: Those natural areas intended for the protection of land and water landscapes and recreation.

Reserves of Managed Resources: These are areas that make it possible to combine the conservation of biological diversity with the sustainable use of ecosystems and their components.

Biosphere Reserve: They are those areas that allow the constitution of a flexible use unit and allow the harmonious coexistence of different modalities of use and conservation, which include other categories of management inside its limits.

According to the Map of Protected Wildlife Areas in Paraguay (SINASIP/SEAM, 2007; DASP/DGPCB/SEAM, 2011) the country has 68 protected units, i.e. 27% of its territory is under some category of protection. In the department of Concepción, the protected areas are divided into the following categories:

Table 1 – Protected Wildlife Areas in Paraguay (SINASIP/SEAM, 2007; DASP/DGPCB/SEAM, 2011)

Categories (SINASIP*)		Law	Area (ha)
National Parks	National Park Serranía de San Luís	Decree 20,712	103,018
	National Park Serranía de San Luís	Decree 17,740	10,273
Private natural reserves	Natural Reserve Cerrados del Tagatiya	Decree 7,791	5,700
	Natural Reserve Tagatiya mi	Decree 10,396	33,789
Biosphere Reserves	Biosphere Reserve of the Cerrado del Río Apa**	Decree 14e431	267,836

Source: * SINASIP: “Sistema Nacional de Áreas Silvestres Protegidas del Paraguay”, National System of Protected Wildlife Areas of Paraguay (2007); ** biosphere Reserve del Cerrado del Río Apa is inserted both in Department of Concepción and Amambay (SEAM, DGECC, 2010).

In addition to the protected areas mentioned above in the study conducted by the World Database on Protected Areas (WDPA, 2017), the Department of Concepción has two other private natural reserves: Guayacán I, II and III and Arrecife. Although the department of Concepción has approximately 300,000 hectares of protected wildlife areas, both public and private, i.e. just over 15% of the total area of its territory, these are concentrated in the northern portion of the department.

Ramsar Convention

The Convention on Wetlands is the intergovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources. The Convention was adopted in the Iranian city of Ramsar in 1971 and entered into force in 1975. Since then, almost 90% of the UN member states, from all geographic regions of the world, have agreed to become "Contracting Parties", and it was ratified by Paraguay by Law 350/94 of February 2 (Dominguez, 2015).

This convention gives member countries the responsibility to develop and implement a plan to promote the conservation of wetlands included in the list of international importance and beyond the wise use of all wetlands in their territory. In this sense, it certifies the creation of nature reserves with the corresponding measures for their custody. In addition, the signatories are charged with promoting research and the exchange of data and publications related to wetlands and their fauna and flora (RAMSAR 2006 apud Domínguez, 2015).

Paraguay currently has 6 sites designated as Wetlands of International Importance (Ramsar sites), covering an area of 785,970 hectares (<https://www.ramsar.org/wetland/paraguay>):

Negro River (Ramsar n°. 729)

Located at 19°52'S and 58°34'W, on the border between Bolivia and Brazil, with a surface area of 370,000 ha it represents a river system of lakes and course located in an ecotone resulting from the confluence of three biogeographic provinces with a representative fauna.

Chaco Lodge Lagoon (Ramsar n°. 1330)

Located in Presidente Hayes, at 22°17'S and 59°18'W, it is a private reserve with 2,500 hectares of surface area. The Chaco Lodge is a salt water lake with marked level fluctuations, surrounded by xerophilic forests and bushes and halophilic vegetation, frequented by many species of birds.

Teniente Rojas Silva Lagoon (Ramsar n°. 1390)

Located in Boquerón at 22°38'S and 59°03'W, it is a private reserve with 8,470 ha of surface area. It occupies part of the basin of the South Yakaré stream in the Paraguayan Chaco, and this lake alternates between fresh and salt water conditions.

Tifunque (Ramsar n°. 730)

Located in Presidente Hayes, at coordinates 24°15'S and 59°30'W, it is a National Park with a surface area of 280,000 ha, which includes an alluvial plain along the Pilcomayo River, flooded most of the year and characterized by patches of forest, extensive grouped lakes and palm tree savannahs.

Estero Milagro (Ramsar n°. 731)

Located in San Pedro at 23°34'S and 57°22'W, it is a National Park with a surface area of 25,000 ha. The area is characterized by natural pastures, low forests, savannahs and gallery forests, swamps, small marshes and a great diversity of plant species. The site provides an important aquatic habitat for migratory birds and other animals associated with aquatic environments, as well as a habitat for the survival of several rare species and threatened plant species.

Ypoá Lake (Ramsar n°. 728)

Located in Paraguari, Ñeembucú, Central in the coordinates 26°30'S and 57°33'W, it is a National Park with 100.000 ha of surface. It is an area of extensive, shallow, grouped lakes (esterales) with mats of floating vegetation, some of which support small trees and fauna. The marshes are interspersed with wooded islands, savannahs, rocky areas and streams. This site provides excellent habitat for wildlife and is one of the most important aquatic environments in Paraguay, important for several endangered species, migratory birds and five threatened plant species.

Although Paraguay has the six Wetlands of International Importance mentioned above, no Ramsar areas have been identified in the project's areas of influence.

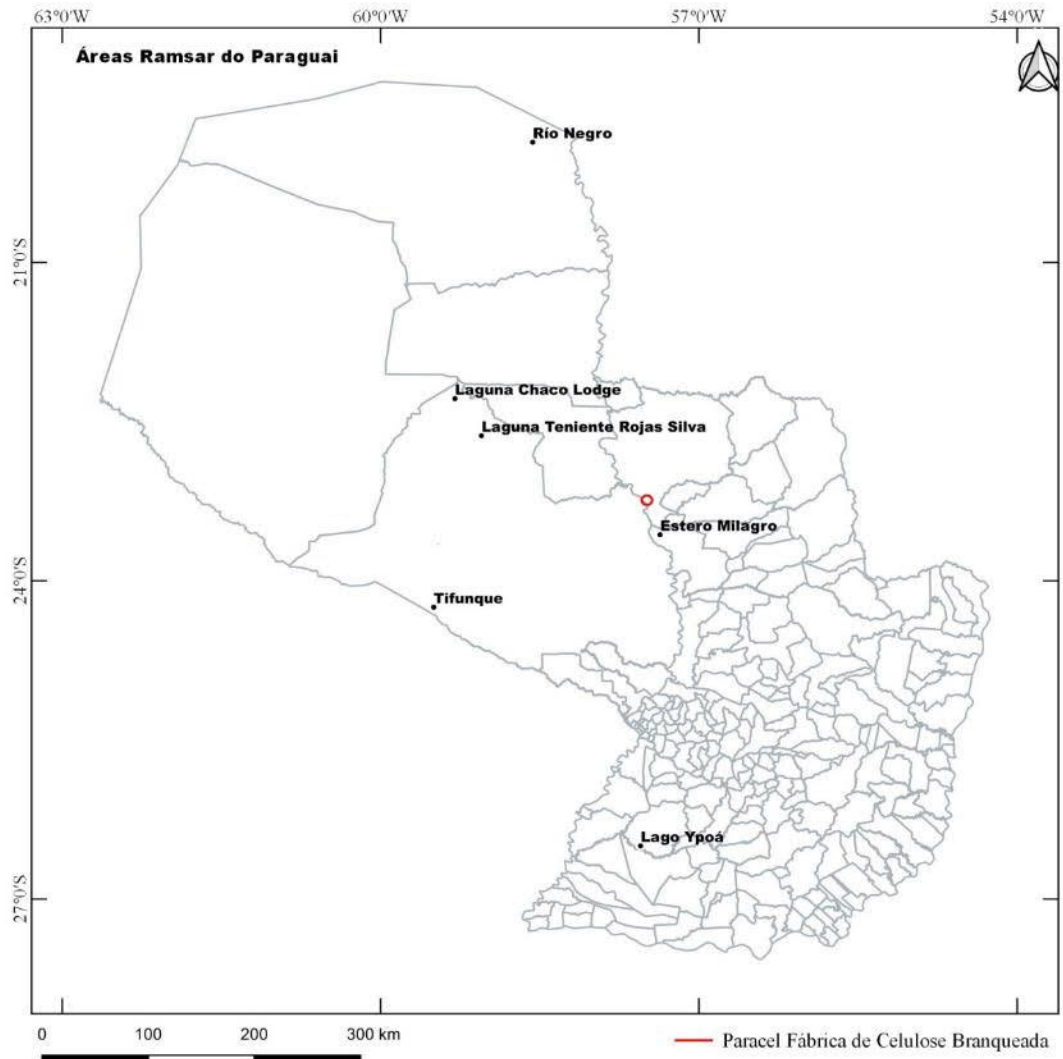


Figure 1 – Map of Ramsar areas in Paraguay. Source: Ramsar Sites Information Service (Available at: <https://rsis.ramsar.org/>).

Priority Conservation Areas

According to MADES/DGPCB (2019), information from the studies: Priority Areas for Conservation in the Eastern Region of Paraguay by the Centro de Datos para la Conservación - CDC (1990) and the Project "Priority Areas for Conservation in Five Ecoregions of South America", Project GEF/1010-00-14, was used to define priority conservation sites.

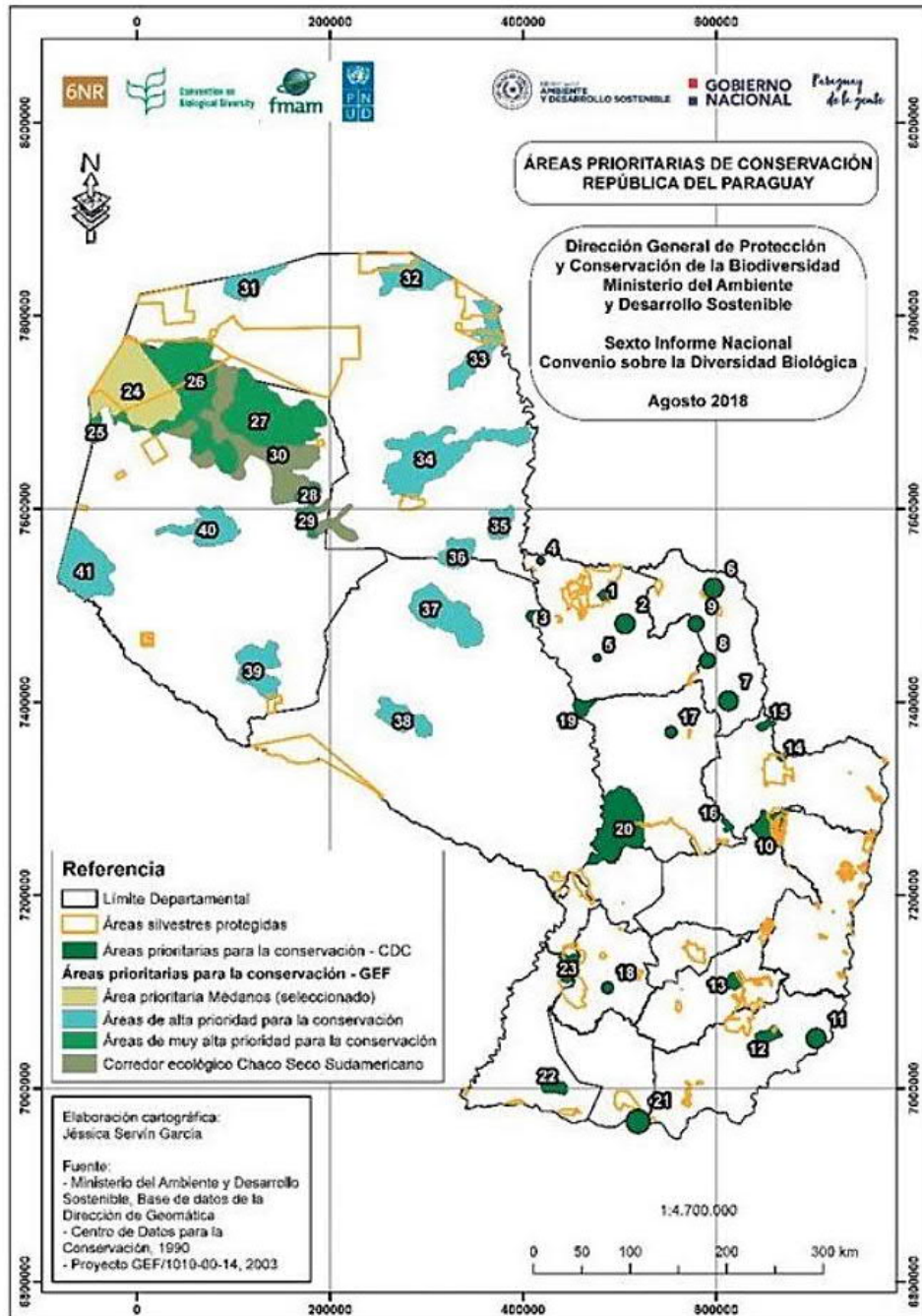


Figure 2 – Map of Priority Conservation Areas (2018). Source: MADES/DGPCB (2019).

Many of the priority areas for conservation identified in the above-mentioned studies overlap with existing protected wildlife areas - ASPs, however, in the eastern region 23 priority areas were identified that had the following characteristics: they were threatened, represented perhaps the last remaining characteristic in a virgin state of the representative ecosystems of each ecoregion, and needed more detailed scientific research. Of these 23 areas, the first five in order of priority are Mbaracayú, Bosque Arary, Cerro Guazú, Serranía San Luis and Serranía San Rafael.

In the western region, 18 priority areas were identified, which were subdivided into high and very high priority areas for conservation and two areas corresponding to the Médanos and the Chaco ecological corridor of South America. This classification took into account ecological and landscape criteria, combined with anthropogenic pressure factors and existing protected areas, and was carried out by means of a GAP analysis, which according to the CBD (Convention on Biological Diversity) is an evaluation of the degree to which a system of protected areas meets the protection objectives established by a nation or region to represent its biological diversity. High priority conservation areas have high diversity, endemism and globally important energy resources distributed over a large part of the proposed territory, as well as a high representation of highly threatened taxons and species.

The high conservation priority areas are important because of the concentration of threatened species according to IUCN, biological diversity, scenic beauty and the presence of migratory birds on Appendices I and II of the Convention on Migratory Species.

Protected Areas within the plantation farms

Regarding PS6 area prohibitions such as national park boundaries, confirmed via secondary sources are the following:

- There are three IUCN Category II national parks (Parques Nacionales – PN) north of the plantations:
 - PN Serania San Luis is approximately 15 km west of the Soledad plantation;
 - PN Paso Bravo borders three Parcel owned plantations: Soledad, Zanja Moroti, and Hermosa;
 - PN Bella Vista borders the Zapallo plantation;
- There are no Ramsar sites within the Project nor surrounding areas. The closest Ramsar Site is the National Park Estero Milagro, downstream of the Project and south of the city of Concepción;
- There is one Biosphere Reserve, Cerrado del Rio Apa, near the Project, established in 2001 by Executive Decree No. 14,431. The reserve borders much of Project plantations and its boundaries overlap portions of the northeastern most plantation Zapallo. The core areas of the reserve are within the Paso Bravo and the Serrania San Luis National Parks. The National System of Protected Natural Areas (SINASIP) considers the core areas of biosphere reserves as officially protected areas, however areas outside of core areas are not officially part of SINASIP. The core area of Cerrado del Rio Apa includes 267,836 ha while the other 174,224 ha has not been declared an official protected area by SINASIP, and it is within Zapallo and north Santa Teresa plantation areas;
- There are two Important Bird Areas (IBAs)³² near Parcel plantations:
 - Arroyo Tagatiya which sits greater than 15 km west of the Soledad plantation; and
 - Cerrados de Concepcion which overlaps with both the UNESCO Biosphere Reserve and the PN Paso Bravo, and which borders three Parcel owned plantations: Soledad, Zanja Moroti, and Hermosa.

Therefore it is recommended that in Soledad, Zanja Moroti, Hermosa, Zapallo and Santa Teresa plantation areas, a differentiate Land Use should be performed to increase the conservation areas.

6.1.2 Methodology

6.1.2.1 General

The proposed methodological intervention focuses on the Rapid Ecological Assessment (REA). The REA methodology integrates multiple levels of biological and ecological information for effective decision-making on conservation, planning, and management (Sayre et al. 2000). It allows to collect, interpret and interrelate, at the office and field level, all the scientific - technical information possible to obtain on the study area in a limited time (Sobrevila & Bath 1992). The information is collected through a process known as stratified sampling, which allows the analysis of data at a gross level or of little detail, this guiding the collection and analysis of data at a level of greater detail.

For this proposal, as considered relevant, level 2 and level 4 data (from a REA) were applied. At the Level 2: High resolution images, to produce a Vegetation Cover Map. This vegetation cover map made it possible to identify not only the existing ecosystems within the ecoregion(s) but also the identification of natural communities. These landscape units were referenced and quantified in terms of area. And, Level 4: Field work, to produce information on species diversity and habitat quality. As planned, species diversity was measured in terms of specific richness and abundance.

In addition, in order to offer a complete baseline, existing maps and cartographies were used, including a map of ecoregions, changes to land use and deforestation events, a map of priority areas, water resources, edaphic and climatic resources, to offer complete information for decision making.

The basic steps, according to the methodology of a REA include: Definition of objectives, Data acquisition, Data analysis, Analysis verification, Product generation, Recommendations and applications. This analysis allows generating the evidence and demonstrating the routes for obtaining the information so that the same methodology, with or without modifications, could be repeated in the future, thus giving the best possible use to the Baseline Study.

In order to understand the number of species collected and the sampling effort, techniques for accumulation curves and biodiversity indices (Shannon-Weaver and Simpson) were used which are described in each of the taxa.

The biodiversity baseline study was divided in two field campaigns, one during the rainy season carried out from 12th to 22nd December 2020, and from 25th March and 5th April 2021, and another in the dry season, carried out 9 to 20th May 2021 developed early in the dry season. The dates of March 25 as part of the rainy season, such as the beginning of May for the dry season, were carried out according to the requirements of the contractor to complete the biodiversity base sampling. In total, effective field tasks of 10.5 days were carried out in December with four sampling areas (AM), 9.5 days in March with three AMs and 9.5 days of sampling in May in seven AMs areas with a duplicated team working synchronously. This gives a total of 29.5 days of effective field work with an investment of 4.21 days per AM in total for both seasons, or 2.1 days per AM per season.

Five workshops for the preparation and selection of sampling areas were carried out using information based on GIS as well as lists of cited species and of possible occurrence at the sites. Representative areas were selected based on the criteria of representativeness and convenience. An extensive bibliographical search was carried out for all taxonomic groups, focusing on those occurring within the departments of Concepción and western Amambay, so as to be prepared for what we could expect to find at the sites, based on possible species records from scientific articles, scientific collections and records from other surveys carried out in neighboring properties as well as in conservation areas.

Meetings were held with professionals from PARACEL and at their invitation with experts from international financial entities, after these meetings the decision was made to expand the first field campaign from December 2020, and to carry out a second sample at the end of the rainy season (March and April), in addition to designing a sampling for chiroptera using modern bioacoustic techniques and environmental DNA sampling in some 190 localities that had water available. These two components, chiroptero fauna and Environmental DNA, will be the focus of another report. However, bat sampling and monitoring carried out asynchronously with the team (in April) is integrated in this baseline. A preliminary report on eDNA in the samples is integrated in this report. Additionally, data on other biodiversity species, such as invertebrates and fungi, add information to this baseline report.

The studies were carried out mainly on seven properties (estancias), which are referred to as sampling areas. These were identified as representative areas of the ecoregions and include all the environmental units previously identified as relevant. The sampling areas are Soledad, Gavilán, Trementina, Hermosa, Zapallo, Santa Teresa and San Liberato. Sampling stations, sampling points and transects in all taxonomic groups were associated to the identified plant formations while ichthyofauna was the only group in which complementary stations took place.

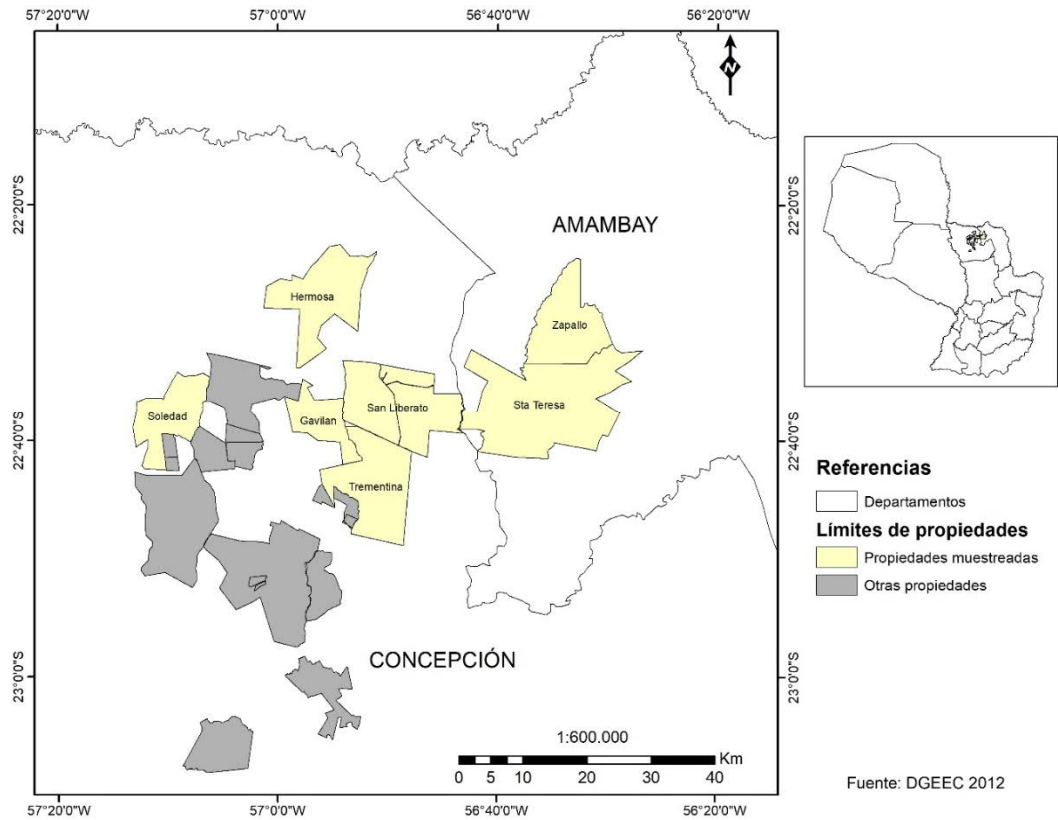


Figure 3 – Map showing sampling areas.

In terms of fieldwork, methodologies were carried out according to the type of taxa being studied, applying direct and indirect methods, as well as employing the use of drones to confirm the GIS analysis where necessary. At all times, the sampling sites were guided by the natural communities and a botanical survey (Table 2–1, Figure 2–2). The various specialists worked together, comprehensively, documenting all records thoroughly. Movements between sampling sites were made to secure any relevant record that might enrich the biodiversity baseline (“casual records/sightings”, in the REA methodology); furthermore, night patrols were also carried out in order to increase the probability of finding the more cryptic species. The local inhabitants and ranch personnel were contacted *ad libitum* to inquire about the presence of observed species. The entire team worked with any available digital platforms (@Avenza Maps) taking advantage of these for photographs and geolocations.

To determine the degree of threat according to the International Union for Conservation of Nature (IUCN), the website of the Red List was consulted (<https://www.iucnredlist.org/>); meanwhile, the degree of threat at a national level was determined based on the official resolutions of the Ministry of the Environment and Sustainable Development (MADES): Res. MADES N°470/19 for flora, Res. MADES N°433/19 for amphibians, Res. N°254/19 and SEAM N° 632/17 for birds and mammals, and MADES Res. N°206 for reptiles. To determine whether any species were included in a CITES Appendix, the website of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was consulted (<https://cites.org/esp/disc/species.php>). For the identification of uses, various types of bibliographic sources were consulted, and complemented further based on the

knowledge of experts and local inhabitants, as well as observations during fieldwork (in the case of melliferous species and consumption by fauna).

6.1.2.2 Specific

Plants and Vascular Flora

For the characterization of plants and vascular flora, a preliminary classification of the plant formations and communities was carried out and the sampling sites were established during deskwork. Data was collected from 34 Sampling Stations (EM) of 50m x 4m for forest formations and 50m x 2m for *campos cerrados*, *campos sucios*, and savannas. Similarly, 25 circular Observation Points (PO) with a 10m radius were set up and complemented with casual sightings (records of relevant/representative species outside EMs and POs). All species sighted in EMs, POs or OCs were identified and recorded in field forms, following Sayre et al. (2002). All fertile specimens were collected (whole herbs and cuttings from subshrubs, shrubs and trees) and deposited in the Herbarium of FACEN / National University of Asunción. Non-fertile specimens were collected in the case of missing determinations. Plant environments and communities were identified and described, specifically recording data on dominant and rare species. The plant formations were characterized following the criteria proposed by Mereles (2007), Prado (2000) and Spichiger et al. (1995). The list provided in the results section contains updated scientific nomenclature, based on internationally accepted databases and specialized publications.

Table 2 – Summary of Sampling Sites (original names in Spanish remains for comparisons).

Legend: *EM*: estação de amostragem, *PO*: ponto de observação. *Mata Ciária* (Mereles & Duré Rodas (2015))

N°	Site	Code	Formation/Community	Geographical Coordinates	Altitude (masl)
1	Gavilán	EM1	Floodable Savanna (Unnamed stream) Sabana inundable (Arroyo sin nombre)	22°40'15"; 56°54'00"	138
2	Gavilán	EM2	Degraded Tall Forest (<i>Attalea phalerata</i>) Bosque Alto degradado (<i>Attalea phalerata</i>)	22°40'20,3"; 56°53'44,7"	155
3	Gavilán	EM3	Degraded Tall Forest (<i>Guarea guidonia</i>) Bosque Alto degradado (<i>Guarea guidonia</i>)	22°40'20,3"; 56°53'44,3"	164
4	Gavilán	EM4	Riparian Forest (<i>Salacia elliptica</i>) Bosque ribereño o marginal (<i>Salacia elliptica</i>)	22°40'03,1"; 56°53'44,3"	143
5	Gavilán	EM5	Dirty Field Campo sucio	22°37'37,3"; 56°57'03,5"	182
6	Gavilán	PO1	Floodable Savanna (intersection Eucalyptus plantations) Sabana inundable (Intersección Eucalyptal)	22°39'00"; 56°54'35,5"	148
7	Trementina	EM1	Riparian Forest Bosque ribereño o marginal	22°43'56,1"; 56°51'13,6"	143
8	Trementina	EM2	Riparian Forest (<i>Coussarea platyphylla</i>)	22°43'10,8"; 56°52'45,3"	131

N°	Site	Code	Formation/Community	Geographical Coordinates	Altitude (masl)
			Boque ribereño o marginal (<i>Coussarea platyphylla</i>)		
9	Trementina	PO2	Aquatic and Palustrine Vegetation Vegetación acuática y palustre	22°43'54,7"; 56°54'31"	153
10	Trementina	PO1	Riparian Forest along drainage ditch Bosque ribereño o marginal en Canal de drenaje	22°43'53,5"; 56°51'12"	136
11	Soledad	EM1	<i>Campo cerrado</i>	22°39'46,7"; 57°12'11,2"	219
12	Soledad	EM2	Riparian Forest Bosque ribereño o marginal	22°39'40,0"; 57°12'04,0"	213
13	Soledad	EM3	Riparian Forest Bosque ribereño o marginal	22°39'52,6"; 57°12'05,3"	213
14	Soledad	EM4	Floodable Savanna Sabana inundable	22°38'31,8"; 57°11'45,4"	231
15	Soledad	EM5	<i>Cerradón</i>	22°36'35,6"; 57°08'59,2"	
16	Soledad	EM6	<i>Cerradón</i>	22°36'24,6"; 57°08'47,1"	263
17	San Liberato	EM1	Riparian Forest (unnamed stream) Bosque ribereño o marginal (Ao sin nombre)	22°40'05,9"; 56°49'40,1"	157
18	San Liberato	EM2	Degraded Tall Forest Bosque Alto Degradado	22°39'17,0"; 56°51'35,1"	215
19	San Liberato	EM3	Degraded Tall Forest Bosque Alto Degradado	22°39'10,4"; 56°51'50,9"	197,43
20	San Liberato	EM4	<i>Cerradón</i> Patches <i>Cerradón</i> en Isla	22°39'09,9"; 56°52'08,0"	193
21	San Liberato	PO1	Unnamed Stream Arroyo sin nombre	22°40'05,9"; 56°49'40,1"	157
22	San Liberato	PO2	Tall Savanna of <i>Elionurus</i> Sabana alta de <i>Elionurus</i>	22°38'57,8"; 56°52'28,6"	177
23	San Liberato	PO3	Floodable Savanna with <i>Copernicia alba</i> Sabana inundable de <i>Copernicia alba</i>	22°38'28,2"; 56°53'36,8"	158
24	San Liberato	PO4	Dirty Field (<i>Anacardium humile</i>) Campo sucio (<i>Anacardium humile</i>)	22°38'09,8"; 56°53'47,2"	146
25	San Liberato	PO5	Forest Patches <i>Tocoyena Formosa</i> Isleta <i>Tocoyena Formosa</i>	22°38'09,8"; 56°53'47,2"	146
26	San Liberato	PO6	<i>Cerradón</i> (white sand) - <i>Dimorphandra mollis</i>	22°36'55,3"; 56°53'27,0"	162
27	San Liberato	PO7	Trementina Gallery Forest - <i>Bactris glaucescens</i>	22°37'54,0"; 56°54'01,2"	142
28	Santa Teresa	EM1ST	Degraded High Forest Bosque Alto Degradado	22°36'17,6"S; 56°33'30,0"W	189
29	Santa Teresa	EM2ST	Degraded High Forest Bosque Alto Degradado	22°36'16,8"S; 56°33'37,3"W	215
30	Santa Teresa	EM3ST	Riparian Forest Bosque ribereño o marginal (Ao Napegue)	22°36'32,0"S, 56°33'08,0"W	174
31	Santa Teresa	EM4ST	Floodable Savanna Sabana inundable	22°36'29,2"S, 56°33'14,6"W	166
32	Santa Teresa	EM5ST	High Savanna Sabana alta	22°35'22,0"S, 56°33'51,0"W	178
33	Santa Teresa	EM6ST	Floodable Savanna Sabana inundable	22°38'27,9"S, 56°39'00,8"W	172
34	Santa Teresa	EM7ST	Floodable Savanna Sabana inundable	22°39'39,8"S, 56°37'48,0"W	168
35	Santa Teresa	EM8ST	High Savanna Sabana alta	22°39'25,8"S, 56°41'27,3"W	163

N°	Site	Code	Formation/Community	Geographical Coordinates	Altitude (masl)
36	Santa Teresa	PO1ST	Forest Edge, degraded area Borde de bosque zona degradada	22°36'20.1"S, 56°33'14,8"W	185
37	Santa Teresa	PO2ST	Riparian Forest Bosque ribereño o marginal (Ao Napegue)	22°36'31.8"S, 56°33'08,8"W	166
38	Santa Teresa	PO3ST	High Savanna Sabana alta	22°36'49.4"S, 56°33'25,5"W	165
39	Zapallo	EM1Z	High Savanna Sabana Alta	22°25'26.2"S, 56°22'48,1"W	202
40	Zapallo	EM2Z	Floodable Savanna Sabana inundable	22°31'33.5"S, 56°32'32,6"W	187
41	Zapallo	EM3Z	Flooded Savanna Sabana inundada (Riacho kuriju)	22°30'24.6"S, 56°30'59,3"W	210
42	Zapallo	EM4Z	Dirty Field Campo sucio	22°31'18.5"S, 56°36'35,5"W	163
43	Zapallo	PO1Z	Riparian Forest Bosque ribereño o marginal (Ao Negla'i)	22°24'37.3"S, 56°32'21,4"W	191
44	Zapallo	PO2Z	Embalsado (Riacho kuriju)	22°30'24.5"S, 56°30'58,2"W	211
45	Zapallo	PO3Z	Cerradón	22°30'22.0"S, 56°31'04,3"W	210
46	Zapallo	PO4Z	Cerradón	22°31'59.4"S, 56°36'15,1"W	183
47	Hermosa	EM1H	Floodable Savanna Sabana inundable	22°28'02.1"S, 56°57'41,8"W	218
48	Hermosa	EM2H	Pastura/Pasture Urochloa brizantha	22°24'35.6"S, 56°55'04,8"W	221
49	Hermosa	EM3H	Cerrado	22°31'13.6"S, 56°56'44,0"W	171
50	Hermosa	EM4H	Pastura/Pasture Urochloa brizantha	22°27'13.3"S, 56°54'58,5"W	215
51	Hermosa	EM5H	Riparian Forest Bosque ribereño o marginal (Ao Trementina)	22°31'17.4"S, 56°56'52,4"W	186
52	Hermosa	PO1H	Riparian Forest Bosque Ribereño Ao. Trementina	22°31'08.2"S, 56°56'28,8"W	
53	Hermosa	PO2H	Pastura/Pasture Urochloa humidicola	22°28'4.2"S, 56°58'06,9"W	187
54	Hermosa	PO3H	Pasture of Urochloa humidicola with forest islands Pastura Urochloa humidicola con isletas de bosque	22°27'39.5"S, 56°57'29,7"W	216
55	Hermosa	PO4H	Forest Islands (100 m around PO) Isletas de bosque (100 metros a la redonda del PO)	22°28'04.2"S, 56°58'06,9"W	216
56	Hermosa	PO5H	High degraded Savanna (Pasture of degraded U. brizantha) Sabana Alta degradada (Pastura U. brizantha degradada)	22°27'03.9"S, 56°54'57,2"W	215
57	Hermosa	PO6H	Riparian Forest Bosque Ribereño Ao. Hermosa	22° 24' 45,1"S, 56°55' 32,2"W	184
58	Hermosa	PO7H	Floodable degraded Savanna (Pasture U. humidicola) Sabana Inundable degradada (Pastura U. humidicola)	22°24'55.8"S, 56°53'52,8"W	187
59	Hermosa	PO8H	Forest Islands (at 100 m PO7H) Isletas de bosque (a 100 m PO7H)	22°24'58.6"S, 56°53'47,7"W	190

Methodology of work in field campaign



Figure 4 – A: Coordination among different taxonomic teams, B: Pre-processing of botanical sampling, C: Exchange and coordination with PARACEL technicians; D y E: Information gathering in sampling stations (EM)

Ichthyofauna

For the ichthyological survey, active methods were used with cast nets, hand nets and trawling nets as well as manual fish. At night, cast net and manual fishing techniques were used, in addition to crab and umbrella-type traps, each specimen was photographed

and released again employing the catch and release method. At each monitoring point, various combinations of fishing methods were carried out, following a strict procedure: from the marked point three trawls/draws to the left and to the right and ten attempts with the hand net each side, manual fishing (if the site allows) for two hours and several attempts with the cast net. Two umbrella-type traps with eight openings and one of the crab-type traps were also placed on each side, totaling six traps per sampling site. These traps remained in place for approximately 30 hours. For the lentic environments, cast net and manual fishing techniques were employed. Furthermore, the types of aquatic environments were recorded, including dates and coordinates. Eighteen sampling sites were surveyed during 20 days of fieldwork. Ichthyofauna was the only group to include additional sampling sites.

Table 3 – Ichthyological sampling points within the study area

Sampling Sites	Geographical Coordinates	Habitat Classification	Aquatic Environment Type
Point 1 (Ea. Gavilán)	22°40'9.34"S; 56°54'0.39"W	Lotic	Stream
Point 2 (Ea. Gavilán)	22°37'34.79"S; 56°56'57.78"W	Lentic	Reservoir
Point 3 (Ea. Trementina)	22°44'11.00"S; 56°51'36.00"W	Lotic	Stream
Point 4 (Ea. Trementina)	22°44'11.57"S; 56°51'25.49"W	Lentic	Reservoir
Point 5 (Ea. Soledad)	22°36'14.5"S; 57°07'08.9"W	Lotic	Stream
Point 6 (Ea. Soledad)	22°36'30.3"S; 57°06'51.5"W	Lotic	Stream
Point 7 (Ea. Soledad)	22°36'25.0"S; 57°06'29.0"W	Lotic	Stream
Point 8 (Ea. San Liberato)	22°38'20.2"S; 56°53'44.5"W	Lotic	Stream
Point 9 (Ea. San Liberato)	22°37'52.12"S; 56°54'5.29"W	Lotic	Stream
Point 10 (Santa Teresa)	22°36'26.4"S 56°37'17.5"W	Lotic	Stream
Point 11 (Santa Teresa)	22°36'03,3"S 56°33'04,3"W	Lotic	Stream
Point 12 (Santa Teresa)	22°36'48.0"S 56°40'24,6"W	Lotic	Stream
Point 13 (Santa Teresa)	22°38'37,5"S 56°39'26,6"W	Lotic	Stream
Point 14 (Santa Teresa)	22°38'43,7"S 56°41'16,3"W	Lotic	Stream
Point 15 (Zapallo)	22°29'01,5"S 56°32'42,7"W	Lotic	Stream
Point 16 (Zapallo)	22°29'01,4"S 56°32'52,2"W	Lotic	Stream
Point 17 (Hermosa)	22°24'29,7"S 56°52'31,4"W	Lotic	Stream
Point 18 (Hermosa)	22°24'45,3"S 56°53'33,0"W	Lotic	Stream

Photographs for depicting methodology and types of environments.



Figure 5 – A a D – Metodology. E- Lentic environment. F- Lotic environment,
 Photo: (Jimmy Emhart, Christian Baez & Oscar Feltes)

Herpetofauna

Active searches were carried out by day and by night over 20 days along sampling transects ranging 200-300-500 meters for each of the associated plant formations identified. A total of 12 transects with four repetitions in each (except in two of them in which three repetitions, and in three of them two repetitions); thus reaching 40 samples in BA (18), CC (4), SI (8), BR (8) and CD (2). The searches involved observational walks during times of greatest foraging activity; that is, during the morning until noon (10:00 – 13:00) and in the afternoon just before sunset (16:00 – 19:00). Bearing in mind that amphibian and reptile activity times vary substantially at a specific level, potential shelters for frogs, lizards and snakes -such as under logs, rocks and burrows of other vertebrates- were also inspected during in each walk (Heyer et al. 1994, McDiarmid et al. 2012). A total of 94 lists over 54 transects. Random searches were also carried out whenever possible. Amphibian breeding sites were sampled, which were identified during the day (permanent or temporary bodies of water) and by night employing a random search based on auditory scans. Based on the amphibian behavior of having species-specific advertisement calls, where males call females to breeding sites (Duellman & Trueb 1994, Emerson & Boyd 1999), vocalization recordings were employed to identify and record species, making use of the available sound guides (De

la Riva et al. 2000, Haddad et al. 2005, <https://amphibiaweb.org/lists/sound.shtml>) as well as the herpetologist's own database of sound recordings. To confirm the identifications, the vocalizing species were located whenever possible with the aid of a headlamp. Individuals were manipulated either by hand or occasionally with a snake hook or forceps. The following sources were used to consult amphibian taxonomy: Brusquetti & Lavilla (2006), Smith et al. (2012), Weiler et al. (2013), Lavilla & Brusquetti (2018), Magalhaes et al. (2020). In the case of reptile taxonomy, Cacciali et al. (2016), Cacciali & Kohler (2018) were used.

With the data obtained, the total richness was calculated in the entire study area and also in each sampled plant formation. Accumulation curves were generated in the EstimateS program (Colwell, 2013) of species and Chao1 and Jack 1 estimators used to determine how many more species could possibly be present. To compare the diversity between areas, the Simpson and Shannon indices were calculated with the Past v.4 program (<https://www.nhm.uio.no/english/research/infrastructure/past/>).

The herpethology sampling areas included several sites, the sites correspond to natural communities. Natural communities were identified in order to assess the richness and abundance of reptiles and amphibians. In all the sampling areas, Riparian Forests (BR) were evaluated, in three of them Degraded High Forests (BA), while Floodable Savanna (SI), High Savanna (SA) and Aquatic Vegetation (VA), in addition to the Cerrado phytofisionomies, such as Campo Cerrado (CC) and Cerradón (CD).

Table 4 – Herpethology sampling areas Transects and their plant communities (formations)

Sampling area	Natural community /plant formation	Latitude	Longitude
Ea. Gavilán	BA	22°40'15.01"S	56°53'49.93"W
	BA	22°40'21.92"S	56°54'1.19"W
	BA	22°40'31.24"S	56°53'35.77"W
	SI	22°40'10.18"S	56°53'58.14"W
Ea. Hermosa	CD	22°31'13.67"S	56°56'47.06"W
	CD	22°31'13.39"S	56°56'45.09"W
	SA	22°25'1.21"S	56°52'5.96"W
	SA	22°24'47.74"S	56°52'11.08"W
	SI	22°24'31.06"S	56°52'32.06"W
	SI	22°28'24.55"S	56°59'7.03"W
	SI	22°27'46.94"S	56°57'35.14"W
	SI	22°27'40.68"S	56°57'30.85"W
	SI	22°27'16.61"S	56°55'21.58"W
	SI	22°27'15.57"S	56°55'19.98"W
	SI	22°24'39.76"S	56°52'32.87"W

Sampling area	Natural community /plant formation	Latitude	Longitude
	SI	22°24'36.94"S	56°52'24.33"W
	SI	22°24'47.40"S	56°53'24.56"W
Ea. Liberato	BA	22°39'21.02"S	56°51'32.35"W
	BR	22°40'9.95"S	56°49'37.84"W
	CC	22°39'48.70"S	57°12'6.28"W
Ea. Soledad	CD	22°36'33.49"S	57° 8'56.55"W
	SI	22°38'32.75"S	57°11'59.23"W
Ea. Sta. Teresa	BA	22°35'53.73"S	56°33'23.30"W
	BA	22°38'36.88"S	56°38'50.93"W
	BA	22°38'34.74"S	56°39'15.50"W
	BA	22°36'7.10"S	56°33'17.65"W
	BA	22°36'20.34"S	56°33'16.48"W
	SA	22°36'33.38"S	56°40'9.53"W
	SA	22°37'39.18"S	56°40'4.60"W
	SA	22°37'49.97"S	56°40'12.55"W
	SA	22°35'40.61"S	56°33'32.44"W
	SI	22°38'43.67"S	56°38'52.43"W
	SI	22°38'37.69"S	56°39'8.92"W
	SI	22°35'37.40"S	56°33'37.61"W
	SI	22°35'30.43"S	56°33'42.80"W
	SI	22°36'25.66"S	56°33'10.40"W
SI	22°35'55.95"S	56°33'17.92"W	
Ea. Trementina	BA	22°42'44.99"S	56°52'26.57"W
	BR	22°44'7.01"S	56°51'33.84"W
	SI	22°44'4.39"S	56°51'29.62"W
Ea. Zapallo	BA	22°29'3.06"S	56°32'42.55"W
	BR	22°29'1.01"S	56°32'51.43"W
	BR	22°29'2.36"S	56°32'57.44"W
	BR	22°30'41.21"S	56°36'50.56"W
	SA	22°25'41.52"S	56°32'38.69"W
	SA	22°25'39.35"S	56°32'35.37"W
	SA	22°25'30.84"S	56°32'41.27"W
	SA	22°25'32.33"S	56°32'49.59"W

Sampling area	Natural community /plant formation	Latitude	Longitude
	SI	22°31'19.58"S	56°36'35.62"W
	SI	22°31'37.90"S	56°36'19.41"W
	SI	22°30'54.72"S	56°36'31.64"W
	SI	22°31'4.02"S	56°36'32.89"W
	SI	22°30'41.69"S	56°36'44.93"W
	talcal	22°30'48.29"S	56°36'31.60"W

Ornithofauna

Bird observations were made at the sampling sites in the six natural communities visited (BR, BA, SI, VA, CC, CD) by recording the number of individuals of each species by means of 72 transects (four per community) found along 150-meter transects within 15-minute intervals. These observations were carried out during the first three hours after dawn, since this is considered the time of day with most bird activity (Blake 1992 and Ralph et al. 1996). Further observations were made during the afternoon (15:00 to 17:30) prior to a decrease in activity of the diurnal birds to further enrich the inventory and increase the sampling effort through these repetitions, completing the survey by means of 192 lists generated by transect, and 43 lists outside the transects by occasional records. Certain species were also recorded through interviews with local inhabitants and with specialists who either visit often or know the area well; although these interviews do not take into consideration the number of individuals for each species, they do contribute to the total species richness for the area. With regards to the materials used for the observations, we can mention a 10 x 42 binocular and the Identification Guide to the Birds of Paraguay (Narosky & Yzurieta 2006). Furthermore, sound databases were used for playback, including Bird Sounds from Southern South America and Xeno-canto (2005), with the purpose of maximizing the possibility of obtaining more records (such as those endemics to the Cerrado or of probable occurrence), as well as for the validation of the vocalizations heard in the field. For the post-processing of the data back in the office, the taxonomic classification was based on Remsen et al. (2020), meanwhile, bird nests were identified with the aid of a guide to the nests of birds in Paraguay (*Guía de Nidos de Aves del Paraguay*; De la Peña 2010), the state of occurrence was based on Guyra Paraguay (2004), and Silva (1997) was used to determine the species endemic to the Cerrado. In order to support the characterization of the records, the CITES database (UNEP-WCMC 2020) was consulted to determine which species are included. Finally, the IUCN Red List (IUCN 2021) was used to determine the threat categories at an international level, and the MADES Resolution No. 254/19 “Updated list of protected wildlife species: Class Aves” was used to determine the threat categories at the national level.

The ornithological sampling areas included several sites, the sites correspond to natural communities. Natural communities were identified in order to assess the richness and abundance of birds. In all the sampling areas, Riparian Forests (BR) were evaluated, in three of them Degraded High Forests (BA), while Floodable Savanna (SI), High

Savanna (SA) and Aquatic Vegetation (VA), in addition to the Cerrado phytofisnomies, such as Campo Cerrado (CC) and Cerradón (CD).

Table 5 – Sampling sites for the ornithological sampling and natural communities

Sampling areas	Natural community / plant formation		Coordinates
Gavilán	BA	Bosque Alto degradado	22°40'20,3"S; 56°53'44,7"W
	BR	Bosque ribereño o marginal	22°40'03,1"S; 56°53'44,3"W
	SI	Sabana inundable (costado arroyo sin nombre)	22°40'15"S; 56°54'00"W
Trementina	VA	Vegetación acuática y palustre	22°43'54,7"S; 56°54'30,4"W
	BA	Bosque Alto degradado	22°42'56.65"S; 56°52'14.20"W
	BR	Bosque ribereño o marginal	22°43'56,1"S; 56°51'14,9"W
Soledad	CC	Campo cerrado	22°39'46,7"S; 57°12'11,2"W
	BR	Bosque ribereño o marginal	22°39'40,0"S; 57°12'04,0"W
	SI	Sabana inundable	22°38'31,9"S; 57°11'45,4"W
	CD	Cerradón	22°36'35,6"S; 57°08'59,2"W
San Liberato	BR	Bosque ribereño o marginal	22°40'05,9"S; 56°49'40,1"W
	BA	Bosque Alto Degradado	22°39'17,0"S; 56°51'35,1"W
Ea. Hermosa	CD	Cerradón	22°31'13.6"S;56°56'47.0"W
	CD	Cerradón	22°31'13.39"S; 56°56'45.09"W
	SA	Sabana alta	22°25'1.21" S; 56°52'5.96"W
	SA	Sabana alta	22°24'47.74"S; 56°52'11.08"W
	SI	Sabana inundable	22°24'31.06"S; 56°52'32.06"W
	SI	Sabana inundable	22°28'24.55"S; 56°59'7.03"W
	SI	Sabana inundable	22°27'46.94"S; 56°57'35.14"W
	SI	Sabana inundable	22°27'40.68"S; 56°57'30.85"W
	SI	Sabana inundable	22°27'16.61"S; 56°55'21.58"W
	SI	Sabana inundable	22°27'15.57"S; 56°55'19.98"W
	SI	Sabana inundable	22°24'39.76"S; 56°52'32.87"W
	SI	Sabana inundable	22°24'36.94"S; 56°52'24.33"W
SI	Sabana inundable	22°24'47.40"S; 56°53'24.56"W	
Ea. Zapallo	BA	Bosque Alto Degradado	22°29'3.06"S; 56°32'42.55"W
	BR	Bosque ribereño o marginal	22°29'1.01"S; 56°32'51.43"W
	BR	Bosque ribereño o marginal	22°29'2.36"S; 56°32'57.44"W
	BR	Bosque ribereño o marginal	22°30'41.21"S; 56°36'50.56"W
	SA	Sabana alta	22°25'41.52"S; 56°32'38.69"W
	SA	Sabana alta	22°25'39.35"S; 56°32'35.37"W
	SA	Sabana alta	22°25'30.84"S; 56°32'41.27"W
	SA	Sabana alta	22°25'32.33"S; 56°32'49.59"W
	SI	Sabana inundable	22°31'19.58"S; 56°36'35.62"W
	SI	Sabana inundable	22°31'37.90"S; 56°36'19.41"W
	SI	Sabana inundable	22°30'54.72"S; 56°36'31.64"W
	SI	Sabana inundable	22°31'4.02"S; 56°36'32.89"W
SI	Sabana inundable	22°30'41.69"S; 56°36'44.93"W	
Ea. Sta. Teresa	BA	Bosque Alto Degradado	22°35'53.73"S; 56°33'23.30"W
	BA	Bosque Alto Degradado	22°38'36.88"S; 56°38'50.93"W
	BA	Bosque Alto Degradado	22°38'34.74"S; 56°39'15.50"W
	BA	Bosque Alto Degradado	22°36'7.10"S; 56°33'17.65"W
	BA	Bosque Alto Degradado	22°36'20.34"S; 56°33'16.48"W
	SA	Sabana alta	22°36'33.38"S; 56°40'9.53"W
	SA	Sabana alta	22°37'39.18"S; 56°40'4.60"W

Sampling areas	Natural community / plant formation		Coordinates
	SA	Sabana alta	22°37'49.97"S; 56°40'12.55"W
	SA	Sabana alta	22°35'40.61"S; 56°33'32.44"W
	SI	Sabana inundable	22°38'43.67"S; 56°38'52.43"W
	SI	Sabana inundable	22°38'37.69"S; 56°39'8.92"W
	SI	Sabana inundable	22°35'37.40"S; 56°33'37.61"W
	SI	Sabana inundable	22°35'30.43"S; 56°33'42.80"W
	SI	Sabana inundable	22°36'25.66"S; 56°33'10.40"W
	SI	Sabana inundable	22°35'55.95"S; 56°33'17.92"W

Sampling avifauna in different natural communities in study area



Figure 6 – Photo: (Rebeca Irala & Nicolás Cantero)

Mammalian Fauna

Both direct and indirect survey methods were employed. For direct data collection, intensive searches were carried out in which all observed mammals and their traces were recorded, including footprints, feces and other signs of presence. The searches were carried out both on foot and with vehicles through the various natural communities identified, both by day and by night based on the most typical activity patterns of mammals. Twenty-seven sampling stations for nine camera traps were set up for different periods of times with rotating locations according to the explorations of the nine sites with a total of 66 nights/traps in the different plant communities.

This was done to increase the probability of detecting cryptic or rare species. Data on chiropterans were also collected through the use of three mist nets located near the farmhouses to facilitate the working with them while checking the nets; these nets were

opened and checked according to logistic opportunities totaling six nights of sampling. To obtain systematized data, 46 linear transects of 200m x 2m were made in six of the identified natural communities (BR, BA, SA, SI, CC and CD). According to the temporal and spatial possibilities, repetitions were carried out on different days and in different places for each of the formations. Additionally, indirect data were collected from local workers and residents, consulting them at first by the local names and behavior of mammals for later confirm the identification with printed photographs.

The statistical analyzes were carried out taking into account only the data obtained in the linear transects and the camera traps. These analyzes included the construction of a species accumulation curve for all samplings, and the calculation of chao1 and jackknife1 richness estimators for each plant community that had more than 10 sample units (BR, BA, SI and SA) (Thompson and Thompson 2010); Likewise, the estimation of the Shannon-weaver and Simpson diversity indices (Magurran 2004) and the construction of range-abundance graphs (Feisinger 2004) for these plant formations were included. All analyzes were performed with the Estimates software (Colwell 2013) and with the R software (R Core Team 2020) using the BiodiversityR package (Kindt and Coe 2005).

Specialized guides were used for the identification of mammals, their footprints and other signals (De Ángelo 2017, Canevari 2007, Villalba & Yanosky 2000). Furthermore, the identification of species according to their category of threat at a national and international level was carried out following the Red Book of Mammals of Paraguay (APM & SEAM 2017, Resolution SEAM N°632/17 “Updated list of protected wildlife species: Class Mammalia”) and the IUCN Red List (IUCN 2021), respectively. The general taxonomy follows Wilson & Reeder (2005) with updates considered by Sancha et al. (2017), but accepting the change proposed by Segura et al. (2013) for the species *Herpailurus yagouaroundi*.

For a better understanding of the field distribution, sampling stations and observation points (EM, PO), ichthyological points and stations (E), as well as location of camera traps (CT) are depicted in Figure below.

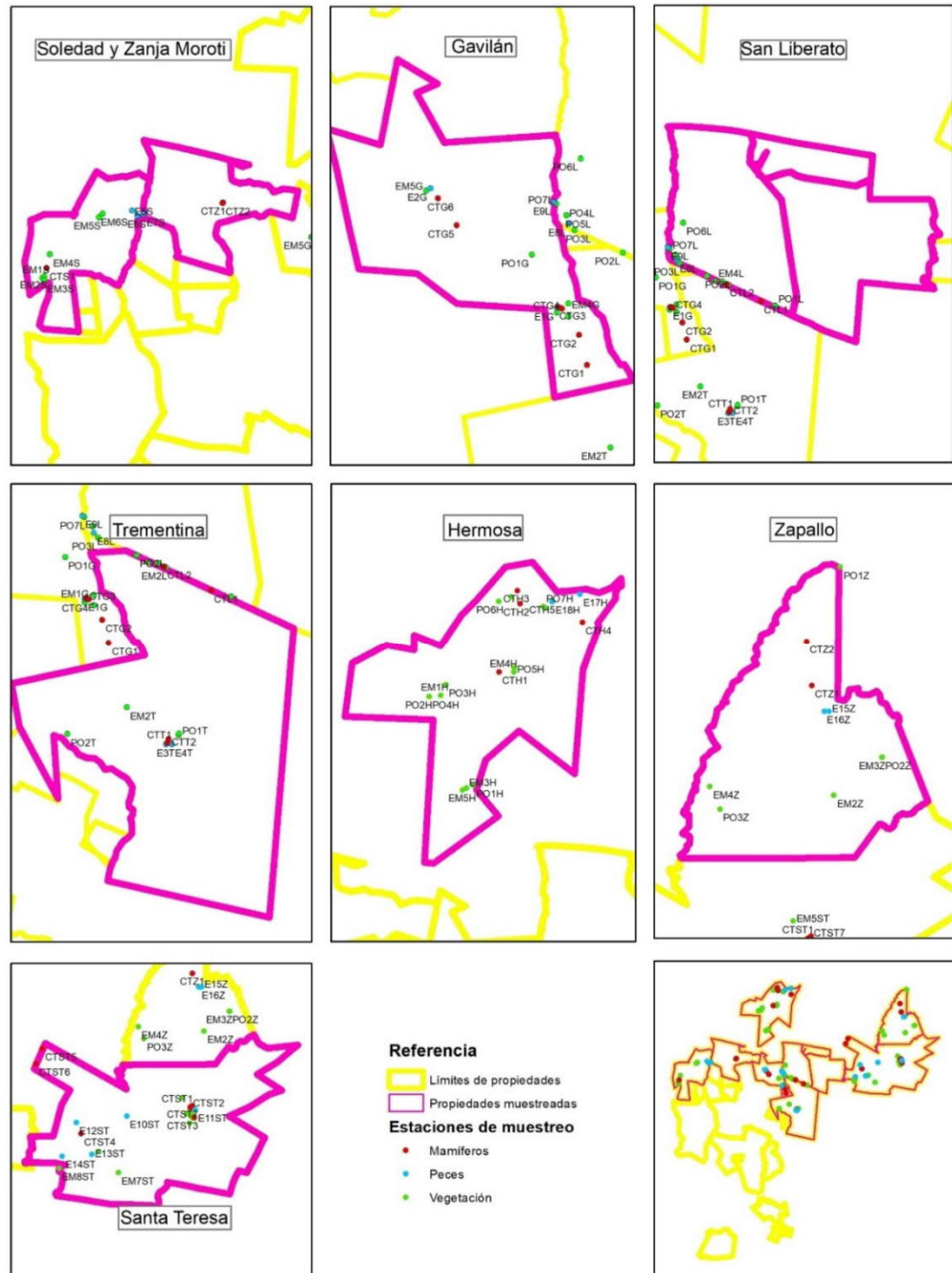


Figure 7 – Location of sampling stations, observation points and camera traps.
 Ref.: PO: Vegetation; E: Ichthyofauna; CT: Trap cameras; EM: Vegetation and fauna. S: Soledad; Z: Zanja moroti; G: Gavilán; T: Trementina; L: San Liberato;

6.1.2.3 Sampling areas and ecoregions

The *Cerrado* in Paraguay occupies relatively small discontinuous areas forming a mosaic pattern. As a formation, the *Cerrado* is classified under various ecoregions (Fig. 3. and Fig. 4); however, it became evident that the study area is more of a convergence between the *Cerrado* and the contiguous Humid Chaco and Upper Paraná Atlantic Forest ecoregions, more in line with what was proposed by Dinerstein et al. (2017). With this in mind, the study area presents a *Cerrado* - Atlantic Forest transitional area to the south and east, meanwhile to the west and south, the study area presents a *Cerrado* - Humid Chaco transition. This confluence results in unique characteristics in terms of the assemblages of fauna and flora present.

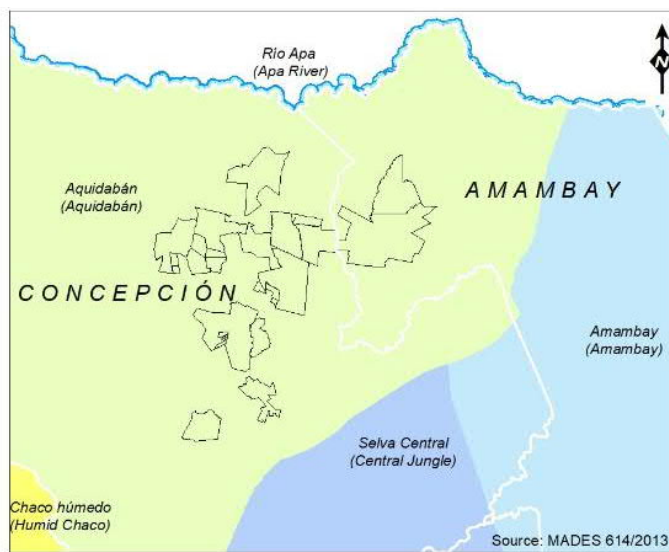


Figure 8 – Location of properties based on MADES Ecoregions (Resolution 614/2013)

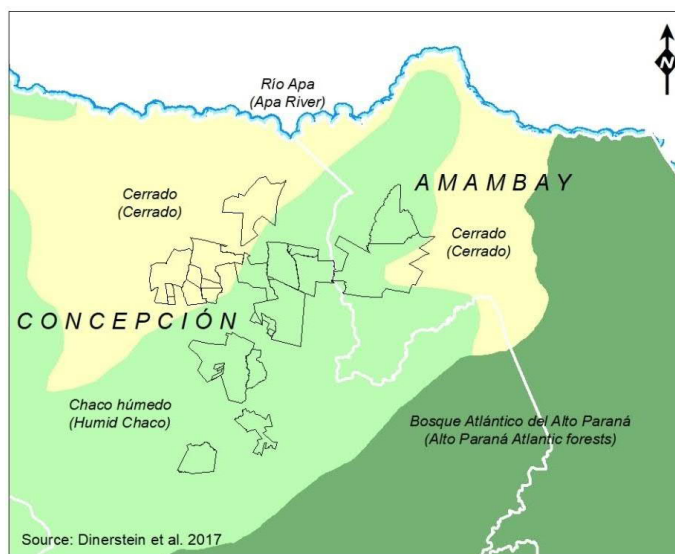


Figure 9 – Location of properties based on Ecoregions by Dinerstein (2017)

In both biogeographical and ecoregional terms, the area is located within the *Cerrado* in a broad sense, yet it is common to find environments that correspond to the Humid Chaco in some properties, while others present elements and environments that correspond to the tall forests of the Atlantic Forest of Alto Paraná.

Within the study areas, tall forests and forest patches develop on the higher grounds with different soil characteristics; this vegetation presents a floristic structure and elements of tall forests. The presence of these forests is easily identifiable in historic images that allow us to visualize the study area prior to the changes made in the productive landscape.

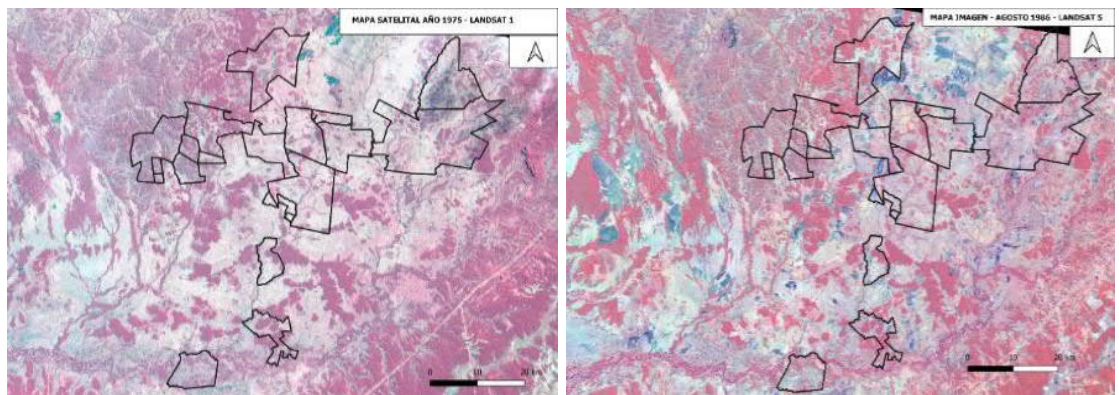


Figure 10 – PARACEL properties on satellite images (Landsat 1) from 1975 and 1986. (Ref.: Vegetation is seen in red tones, darker and more solid red areas represent forests, and lighter and less solid red areas represent sparse vegetation and/or of less height, and lighter tones represent natural grasslands)

6.1.3 Terrestrial Flora Seasonal Results

The floristic richness for the study area is comprised of 667 species of vascular plants, belonging to 346 genera and 94 botanical families. Also the information about common names and conservation status (national, regional, IUCN) is found in the same spreadsheet.

Table 6 – Flora species richness

Taxonomic Group	Number of Species	Number of Families
Pteridophytes	22	09
Monocots	133	15
Dicots	512	70

During fieldwork, the opportunity was taken to record species other than the taxa focused on in the diversity baseline study, including fungi. The collection of images and latter identification resulted in the mention of a total of six species of fungi, in the field campaign of December, and 21 species of fungi with photographic records, five of them with gastronomic importance and nine of medicinal importance, collected during the March-April field campaign.

6.1.3.1 Primary Data – Rainy Season

The following **eight plant formations or plant communities** were identified, three of which correspond to forest phytophysionomies and five to savannas: Degraded Tall Forest, Riparian Forest, *Cerradón*, *Campo Cerrado*, Dirty Fields (*Campo Sucio*), High Savanna and Floodable and Flooded Savanna, each with varying degrees of richness.

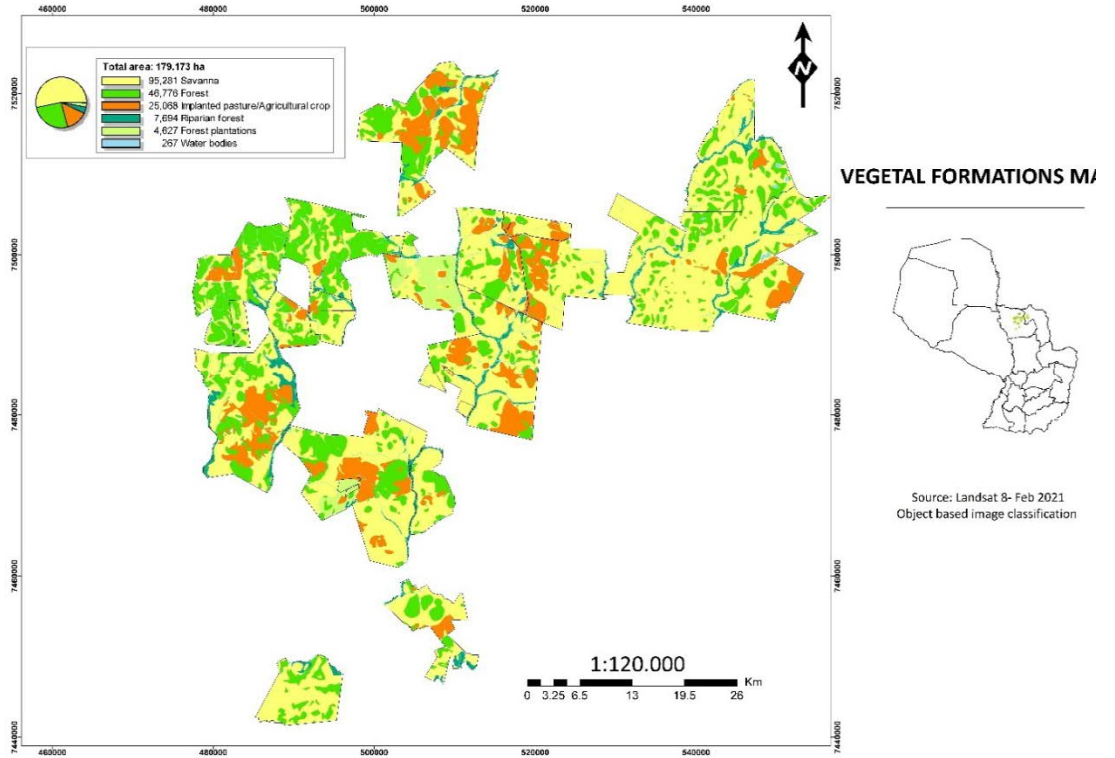


Figure 11 – Plant formations in the different properties. Source: CSI, 2021.

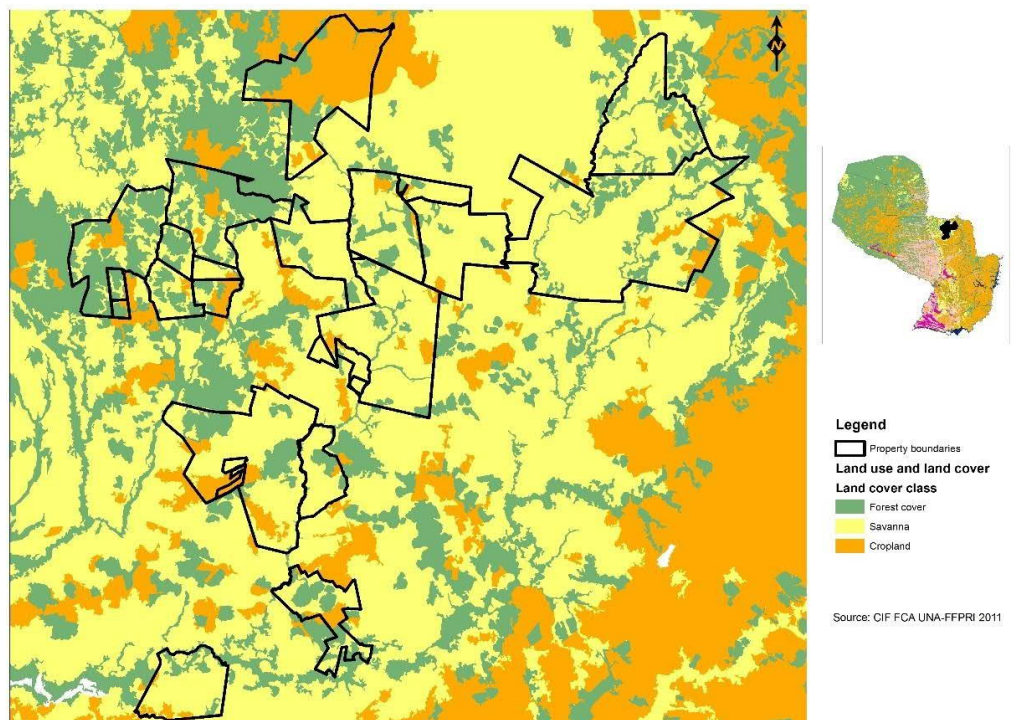


Figure 12 – Imagen Map Cover and Use for all PARACEL properties, after CIF FFPRI FCA/UNA (2011).

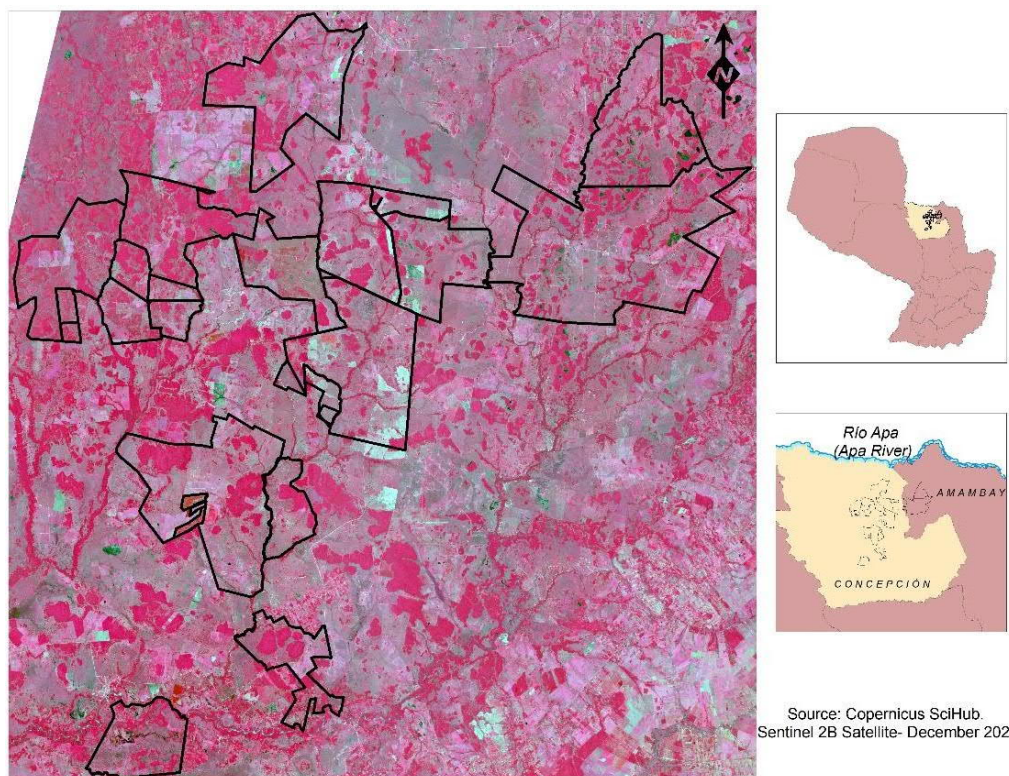


Figure 13 – Imagen map for 2020 Cover (Copernicus SciHub 2020)

As a result of the baseline study, the presence of the different plant communities or formations has been mapped, and the FFPRI-CIF / FCA (2012) map, with it it is possible to compare the changes that have occurred. Also, the 2020 land cover map provides evidence of predominance of sabanoid formations. The complete description of Vegetation is presented below.

The floristic diversity of all the identified plant formations was determined based on direct observations, collections and processing (in the field and in the office) of more than 3,500 specimens of vascular plants (both fertile and sterile).

The flora richness of the studied área is represented by 667 species; 346 genera and 95 families. Eight Families, 15 genera and 21 species are Pteridophyta; 133 species, 57 Genera and 15 Families are Monocotyledonae and 513 species, 274 Genera and 72 Families are Dicotyledonae. The 667 species represent the 10.3 % of the total number of plants estimated for Paraguay (6,500; Mereles 2007). Based on Mereles (2007) estimates for vascular plants, in this study the 6.4% of them have been recorded. Of the 95 Families recorded, 28 of them present a greater diversity.

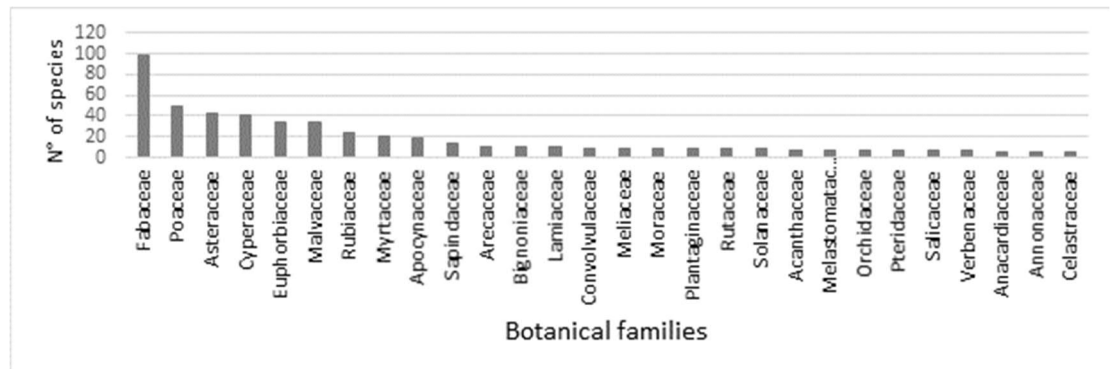


Figure 14 – Families with highest biodiversity identified within PARACEL properties. Source: CSI, 2021.

All plant formations, the flora and the fieldwork process were recorded by approximately 10,000 digital photographs.

The endemic flora (Peña-Chocarro & De Egea 2018) is represented by three species: *Bidens chodatii* (Asteraceae), *Ipomoea* aff. *aemilii* (Convolvulaceae) and *Arachis hassleri* (Fabaceae). Of the total species recorded, 18 are included in the National List (as Endangered or Threatened) and seven are included in the IUCN List. Seven more are included in Appendix II and one in Appendix I of CITES.

Eight types of use were identified (food, fuel, animal feed, industrial, construction material, medicinal, melliferous and ornamental) for 162 species of the flora surveyed within the study area.

6.1.3.1.1 Description of vegetation physiognomies

Degraded Tall Forest (BA)

Is characterized by presenting an average height of 12 m (which can reach up to 18 m) with three strata; the middle and lower strata being the ones with the highest density and diversity of species. In this formation the understory is not very dense, with few epiphytes and lianas. The natural regeneration of some tree species was noted. There is evidence of selective harvesting of its most valuable species and the invasion of exotics in the clearings. The soil is sandy in texture, red in color and covered by a thick layer of leaf litter.

It reaches a height of 16-18 m. **Upper stratum** species *Talisia esculenta* (karaja bola), *Holocalyx balansae* (yvyra pepe), *Guibourtia hymenaefolia* (kuruñai), *Albizia niopoides* (yvyra ju), *Guarea guidonia* (cedro blanco), *Cordia americana* (guajayvi), *Balfourodendron riedelianum* (guatambu), *Aspidosperma pyriformium* (palo rosa), *Cupania vernalis* (jagua rata'y pytã), the **Middle Stratum** species *Myrciaria cuspidata* (typycha ka'aguy), *Amburana cearensis* (trébol), *Astronium fraxinifolium* var. *glabrum* (urunde'y para morotĩ), *Peltophorum dubium* (yvyra pytã), *Casearia gossypiosperma* (mbavy guasu), *Aspidosperma pyriformium* (palo rosa), *Chrysophyllum gonocarpum* (aguai), *Parapiptadenia rigida* (karupa'y rã), *Casearia gossypiosperma* (mbavy guasu), *Helietta apiculata* (yvyra ovi), *Maclura tinctoria* ssp. *tinctoria* (tata jyva),

Cordia americana (guajayvi), *Guibourtia hymenaefolia* (kuruñai), *Albizia niopoides* (yvya ju), **Lower stratum** *Actinostemon conceptionis*, *Philyra brasiliensis*, *Trichilia catigua* (katigua pytã), *Neea pendulina*, *Myrciaria cuspidata* (typycha ka'aguy), *Annona emarginata* (aratiku'i), *Randia calycina* (ñuatĩ kurusu), *Casearia* sp.1, *Combretum leprosum*, *Attalea phalerata* (guacuri), *Randia aff. brevituba* (ñuatĩ kurusu), *Allophylus pauciflorus* (kokũ), *Prockia crucis*, *Celtis iguanaea* (juasy'y).

The **undergrowth** is sparse, made up of herbaceous plants, lianas, natural regeneration. The species present are *Dasyphyllum* sp., *Laciasis sorghoidea*, *Tocoyena formosa*, *Piper* sp.1, *Doryopteris pentagona*, *Justicia brasiliana*, *Geophila repens*, *Oeceoclades maculata* (orquídea burrito), Epífitas what *Microgramma vacciniifolia* (anguja ruguai), *Pleopeltis minima*, Lianas what *Hippocratea volubilis*, *Dalechampia* sp.

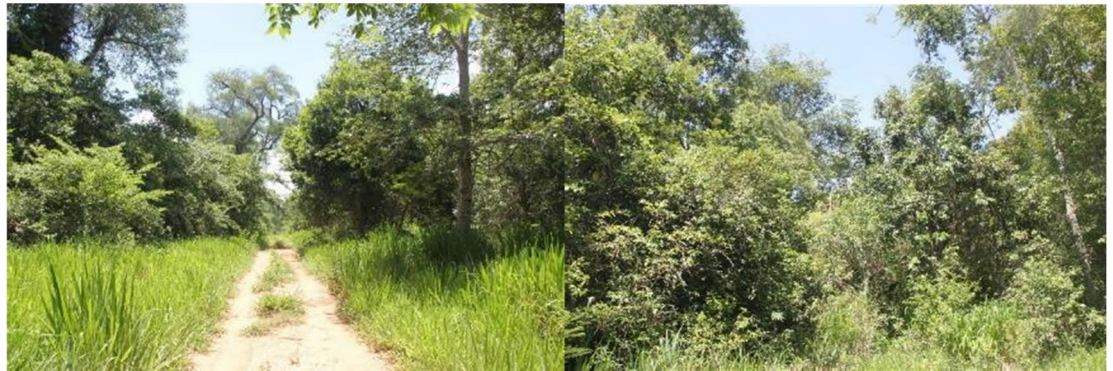


Figure 15 – Degraded high forest - San Liberato (L. Pérez de Molas)

In some sectors, the understory is dominated by *Actinostemon conception* and *Acanthoclada albicans*.

Natural regeneration of *Trichilia elegans* (katiagua'i), *Protium heptaphyllum* (yvya ysy), *Parapiptadenia rigida* (kurupa'y ra), *Ocotea diospyrifolia* (laurel sa'yju), *Rhamnidium elaeocarpum* (taruma'i), *Myrcianthes pungens* (guaviju), *Myrocarpus frondosus* (inciense), *Olocalyx balansae* (yvya pepe), *Amburana cearensis* (trébol), *Aspidosperma pyrifolium* (palo rosa), *Trichilia pallida* (katigua morotĩ), *Actinostemon conceptionis*, *Allophylus pauciflorus* (kokũ).

Cordia trichotoma (peterevy) and *Celtis iguanaea* (juasy'y) are present at the edge and edge of the road. The soil is sandy, covered with litter, with depressions that form areas of accumulation of water, many small clearings invaded by Colonial Pasto.

Relays:

EM2L: Coordinates: 22 ° 30 '17''S 57 ° 51' 35 '' W, Altitude 215 meters above sea level

EM3L: Coordinates: 22 ° 39 '10.4"S 56 ° 51' 50.9 " W, Altitude 197.43 meters above sea level

– **DEGRADED HIGH FOREST - Santa Teresa**

It is a semi-deciduous forest with a height of 22-25 m, it has three layers, **Upper stratum:** *Myroxylon peruiferum* (inciense colorado), *Peltophorum dubium* (yvya

pyta), Myrtaceae (Arraijan), *Guibourtia hymenaefolia* (kuruñai), *Anadenanthera colubrina* var. *cebil* (kurupa'y kuru), *Balfourodendron riedelianum* (guatambu), *Sideroxylon obtusifolium* (guajayvi rai), *Ceiba* sp. (samu'u), *Enterolobium timbouva* (timbo), *Myracrodruon urundeuva* (urunde'y mi), *Handroanthus impetiginosus* (lapacho rosado) **Middle stratum:** *Holocalyx balansae* (yvyra pepe), *Calycophyllum multiflorum* (palo blanco), *Maclura tinctoria* ssp. *tinctoria* (tata jyva) *Parapiptadenia rigida* (kurupa'y rã), *Guazuma ulmifolia* (kamba akã), *Casearia gossypiosperma* (mbavy guasu), *Averrhoidium paraguayense*, *Chrysophyllum gonocarpum* (aguai), *Pterogyne nitens* (yvyra ro), *Myrcianthes pungens* (guaviju), *Agonandra brasiliensis*, *Syagrus oleracea* (guaviroba), *Neea* sp., *Samanea tubulosa* (manduvira), *Helietta apiculata* (yvyra ovi), *Myrciaria cuspidata* (typycha ka'aguy), *Attalea phalerata* (guacuri), **Lower stratum:** se destaca la dominancia de *Gymnanthes discolor*, acompañada por *Trichilia catigua* (katigua pyta), *Trichillia pallida* (katigua moroti), *Adelia membranifolia*, *Allophylus pauciflorus* (koku), others.

The **undergrowth** is sparse with abundant lianas, mainly *Pisonia aculeata* (jagua pinda), *Semialarium paniculatum* and several species of Bignoniaceae, some epiphytes such as *Thaumatococcus undulatum* (guembe), *Peperomia aceroana*; terrestrial herbaceous and woody plants such as *Pharus lappulaceus* (ka'i arro), *Pteris denticulata*, *Doriopteris* sp., *Dioscorea* sp., *Pseudananas sagenarius* (yvira), *Randia* sp., *Trichilia elegans* (katigua'i) and *Clavija nutans* (tummy rasy poha).

Although natural regeneration is scarce, it is present, some of them are: *Holocalyx balansae* (yvyra pepe), *Chrysophyllum gonocarpum* (aguai), *Sweetia fruticosa* (taperyva guasu) and *Helietta apiculata* (yvyra ovi).



Foto: (L. Pérez de Molas)

Figure 16 – Degraded High Forest. Santa Teresa.
26.03.2021

It occupies the highest portions of the land, in discontinuous formations of variable extension, alternating with large areas of high and flooded savannas. The soil is sandy, red, covered by abundant litter. Rocky outcrops appear in some places.

The presence of large ant hills and some fauna burrows were observed. In addition, some stumps of large harvested trees and logging roads that are already in disuse.

Relays

EM 1 ST Coordinates: 22°36'17.6"S 56°33'30.0"W, Altitude 189 msnm

EM 2 ST Coordinates: 22°36'16.8"S 56°33'37.3"W, Altitude 215 msnm

PO 1 ST Coordinates: 22°36'20.1"S 56°33'14.8"W, Altitude 185 msnm

PO 2 H Coordinates: 22°28'4.2"S 56°58'6.9"W, Altitude 218 msnm

TRANSITIONAL (ECOTONAL) FOREST BETWEEN DEGRADED HIGH FOREST AND CERRADON

It reaches a height of up to 11 m. Upper layer *Inga uraguensis* (inga guasu), *Astronium fraxinifolium* var. *Glabrum* (urunde'y para morotĩ), *Guarea guidonia* (white cedar), *Protium heptaphyllum* (yvyra ysy), *Casearia gossypiosperma* (mbavy guasu), *Styrax* sp., Middle stratum *Trichilia pallens* (Katigua morotĩ), *Trichilia pallida* (Stratum morotĩ) bottom: *Peltophorum dubium* (yvyra pytã), *Casearia* sp. 1, *Piper* sp. 1, *Cordia sessilis* (Asuka revira), *Agonandra brasiliensis*.

At the edge of the forest appear *Didymopanax morototoni* (amba'y guasu), *Parapiptadenia rigida* (kurupa'y rã), *Enterolobium contortisiliquum* (timbó), *Anadenanthera colubrina* var. *cebil* (kurupa'y kuru).

Understory: *Myrsine* sp., *Rhamnidium elaeocarpum* (taruma'i), lianas such as *Forsteronia glabrescens* (ysypo kamby), *Prockia crucis*, *Trichilia catigua* (katigua pytã), *Piper* sp.1 Abundant natural regeneration was also observed.

In some sectors this forest reaches a height of only 5-7 m, with emergencies of up to 9 m dominated by *Attalea phalerata* (guacuri). The upper stratum species *Myracrodruon urundeuva* (urunde'y mi), *Sapium haematospermum* (kurupika'y), *Attalea phalerata* (guacuri), *Ficus* sp. (handsome'y), in the middle stratum *Samanea tubulosa* (manduvi rã), *Attalea phalerata* (guacuri), *Machaerium acutifolium*, *Ocotea diospyrifolia* (laurel sa'yju), *Protium heptaphyllum* (yvyra ysy), *Casearia* sp. 1 Lower stratum *Helicteres lhotzkiana*, *Maclura tinctoria* ssp. *Tinctoria* (tata jyva), *Guarea guidonia* (white cedar) and *Attalea phalerata* (guacuri).



Figure 17 – Transitional (ecotonal) forest (high forest – cerradon) - Gavilan.

Foto: (L. Pérez de Molas)

The understory is almost absent, few lianas and very little natural regeneration. The soil is sandy, covered with abundant litter. The gently sloping topography.

Relays:

EM2G Coordinates: 22° 40' 20,3''S 56° 53' 44,7'' W, Altitud 155 msnm

EM3G Coordinates: 22° 40' 20,3''S 56° 53' 44,3'' W, Altitud 164 msnm

Riparian Forests (BR)

Follow water courses, and are generally contiguous with floodable savannas. They are characterized by having an average height of up to 14 m (which can reach up to 18 m) with three strata, the lowest being the one that presents highest density and diversity of species. It is important to highlight the presence of tree species belonging to the *Cerradón*. In this formation, the understory is sparse, with few epiphytes and lianas; however, the natural regeneration of tree species is visible. There is evidence of selective harvesting of its most valuable species as well as the presence of cattle. The soil is sandy and covered by abundant leaf litter. Nine surveys were carried out in this formation and 133 species were recorded.

– Riparian Forest - Trementina stream

It develops on the banks of the Arroyo Trementina, a tributary of the right bank of the Aquidabán River. (Fig. 10)

It reaches a height of 16-18 m. Upper layer: *Peltophorum dubium* (vyvra pytã), *Anadenanthera colubrina* var. *cebil* (kurupa'y kuru), *Protium heptaphyllum* (vyvra ysy), *Aspidosperma pyriforme* (palo rosa), *Inga uraguensis* (inga pytã), *Copaifera langsdorfii* (kupa'y), *Handroanthus heptaphyllus* (tajy hu) **Middle Stratum:** *Chrysophyllum marginatum* (pykasu rembi'u), *Sorocea sprucei* (Maria molle), *Albizia niopoides* (vyvra ju), *Phyllanthus chacoensis* (jakare pito), *Enterolobium contortisiliquum* (timbo), *Garciniabrasiliensis* (pakuri), *Eugenia uniflora* (ñangapiry), *Salacia elliptica* (pakuri brasileiro), *Protium heptaphyllum* (vyvra ysy), *Chrysophyllum gonocarpum* (aguai), *Plathymenia reticulata* (morosyvo), *Coussarea platyphylla*, *Terminalia triflora* (guajayvi sa'yju), *Genipa americana* (ñandypa guasu), *Guibourtia hymenaefolia* (kuruñai), *Vitex cymosa* (taruma), *Attalea phalerata* (guacuri), *Ocotea diospyrifolia* (laurel sa'yju), *Casearia gossypiosperma* (mbavy guasu), **Lower stratum:** *Casearia gossypiosperma* (mbavy guasu), *Salacia elliptica* (pakuri brasileiro), *Parapiptadenia rigida* (kurupa'y rã), *Trichilia catigua* (katigua pytã), *Aspidosperma cylindrocarpon*, *Handroanthus ochraceus* (tajy sa'yju), *Garcinia brasiliensis* (pakuri), *Myrciaria cuspidata* (typycha ka'aguy), *Acanthocladus albicans*, *Cordia sessilis* (asuka revira), *Zanthoxylum petiolare* (tembetary morotĩ), *Randia* aff. *brevituba* (ñuatĩ kurusu), *Coccoloba* sp., *Jacaranda mimosifolia* (jakaranda), *Guarea macrophylla* ssp. *spiciflora* (cedrillo), *Annona emarginata* (aratiku'i), *Trichilia pallens* (katigua morotĩ), *Machaonia brasiliensis*, *Miconia* sp., *Trichilia pallida* (katigua morotĩ), *Randia calycina* (ñuatĩ kurusu), *Bactris glaucescens* (karanda), *Coussarea platyphylla*, *Acanthocladus albicans*, *Celtis iguanaea* (juasy'y).

In some sectors of the forest Guadua chacoensis (takuara), forming small colonizations reaching the shore of the main course, occupying the second layer of the forest. On the edges Annona nutans (aratiku ñu) and Machaerium hirtum.

The undergrowth is sparse, with much litter, the soil is sandy, with very few lianas. Abundant natural regeneration of Myrtaceae and *Inga uraguensis (inga guasu)*. Lianas: *Pisonia aculeata (jagua pinda)*, *Forsteronia glabrescens (ysypo kamby)* and *Forsteronia pubescens*. Epifitas: *Microgramma vacciniifolia (anguja ruguai)*, *M. persicariifolia*, *Polypodium sp.*, *Rhipsalis sp.*, *Campylocentrum cfr. neglectum* y otras herbáceas terrestres como *Adiantum latifolium* and *A. serrato-dentatum*.

In Trementina, the presence of a vegetated lagoon was recorded, with a surface area of 80 x 50 m, whose possible origin was the damming of a water channel. The following bottom-rooted species were surveyed: *Eleocharis elegans* and *Eleocharis sp. (dominant)*, patches of *Pontederia azurea (aguape puru'a)*; on the edge, but within the water *Utricularia sp.*, *Lemna minuta*, *Pontederia cordata (camalote)* and *Nymphoides verrucosa*. *Ludwigia sp.*, *Scoparia dulcis (typycha kuratu)*, *Phyllanthus niruri (para'i)*, *Setaria sp.*, *Hymenachne amplexicaule (camalotillo)*, *Sida cordifolia (white mallow)*, *Polygonum sp. (ka'a tai)*, *Aeschynomene sp.*, *Eupatorium sp. 3*.

In places with higher topography, there are *Sapium haemospermum (kurupika'y)*, *Cecropia pachystachya (amba'y)*, *Sorocea sprucei ssp. saxicola (Maria molle)*, *Tocoyena formosa*, *Acrocomia aculeata (mbokaja)*, *Vitex cymosa (taruma)*, *Ocotea diospyrifolia (Laurel sa'yju)*, *Bromelia balansae (karaguata)*.

Figure 18 – Riparian Forest - **Figure 19** – Marsh aquatic vegetation in Trementina stream. body of water in Trementina



Foto: (L. Pérez de Molas)



Foto: (L. Pérez de Molas)

They are also present *Actinostemon conceptionis*, *Annona neosalicifolia (Aratiku)*, *Syagrus romanzoffiana (pindo)*, *Psychotria sp.*, *Clavija nutans (tumby rasy poha)*, *Acanthocladus albicans*, *Randia aff. brevitiba (ñuatĩ kurusu)*.

Relays:

EM1T Coordinates: 22 ° 43 '56.1''S 56 ° 51' 16.3 '' W, Altitude 143 meters above sea level

EM2T Coordinates: 22 ° 43 '10.8''S 56 ° 52' 45.3 '' W, Altitude 131 meters above sea level

PO1T Coordinates: 22 ° 43 '53''S 56 ° 51' 12 '' W, Altitude 136 meters above sea level

PO7L Coordinates: 22 ° 37 '54''S 56 ° 54' 01.2 '' W, Altitude 142 meters above sea level

– **Riparian forestal in Gavilan (unnamed stream)**

Forest 8-10 m. **Upper stratum:** *Ocotea disospyrifolia* (laurel sa'yju), *Trichilia pallida* (katigua morotĩ), *Genipa americana* (ñandypa guasu), *Samanea tubulosa* (manduvirã), *Guibourtia hymenaefolia* (kuruñai), *Sapium haematospermum* (kurupika'y), *Peltophorum dubium* (yvyra pytä), *Cordia americana* (guajayvi), *Inga uraguensis* (inga guasu), **Middle stratum:** *Cupania vernalis* (jagua rata'y pytä), *Salacia elliptica* (pakuri brasileiro), *Chrysophyllum gonocarpum* (aguai), *Citrus aurantium* (apepu), *Trichilia pallida* (katigua morotĩ), *Attalea phalerata* (guacuri), *Syagrus romanzoffiana* (pindo), *Acrocomia aculeata* (mbokaja), *Terminalia triflora* (guajayvi sa'yju) **Lower stratum:** *Trichilia catigua* (katigua pytä), *Trichilia pallens* (katigua morotĩ), *Casearia sylvestris* (burro ka'a), *Protium heptaphyllum* (yvyra ysy), *Randia calycina* (ñuatĩ kurusu) and *Celtis* sp.1 (juasy'y).

In the **understory** are present *Forsteronia glabrescens* (ysypo kamby), *Bromelia balansae* (karaguata), *Tocoyena formosa*, *Laciasis* sp. and *Miconia* sp.

In Gavilán, in the *Eucalyptus camaldulensis* plantation area, approximately 10 years old, with grasses of up to 80 cm and woody growing in isolation, up to 2 m. *Pleurophora saccocarpa*, *Ludwigia* sp., *Echinodorus grandiflorus* (spoonbill), *Pontederia cordata* (camalote), *Heteropterys* sp., *Aeschynomene* sp. 1, *Paspalum* spp., *Eupatorium* spp., *Eleocharis elegans*, *Aspilia montevidensis*, *Caperonia* aff. *castaneifolia*, *Cuphea lysimachioides* (ysypo pere), *Rhynchospora* spp., *Melochia simplex* among others.

In similar formation in Gavilán, on gray, humid sandy-clayey soil (fine sand), species of the Poaceae family of the genus *Paspalum* sp were also recorded. growing in large clumps, with inflorescences that reach up to 2.5 m. Other registered species were: *Psidium* sp. 3 (arasa), *Sisyrinchium* sp., *Stylosadores* sp., *Setaria* sp., *Annona nutans* (aratiku), *Rhynchospora* sp., *Oedochloa procurrens*, *Imperata brasiliensis* (jahape), *Mimosa* spp. (jukeri), *Eleocharis* spp., *Hyptis* spp., *Cipura paludosa* ssp. *boliviensis*, among others.

The presence of trails was observed, surrounded by gallery forest and low forest of 8-10m. Isolated specimens of *Sapium haematospermum* (kurupika'y), *Cecropia pachystachya* (amba'y), *Myracrodruon urudeuva* (regeneration), *Allophylus edulis* (kokũ), *Schinus weinmanniifolius* (molle'i), *Acrocomia aculeguarisia* (jamaica mbokayaata (jambokaya para i).

Figure 20 – Riparian Forest - Gavilan (unnamed stream).



Foto: (L. Pérez de Molas)

There is abundant natural regeneration of tree species.

Relays:

EM4G Coordinates: 22 ° 40 '3.1''S 56 ° 53' 44.3 '' W, Altitude 143 meters above sea level.

– **Riparian florest (unnamed stream) (Potrero Ita Juru)**

Forest 16-18 m. **Upper stratum:** *Enterolobium contortisiliquum* (timbo), *Syagrus romanzoffiana* (pindo), *Guazuma ulmifolia* (kamba akã), *Cordia americana* (guajayvi), *Peltophorum dubium* (yvyrã pytã), *Casearia gossypiosperma* (mbavy guasu), *Genipa americana* (ñandypa guasu), *Balfourodendron riedelianum* (guatambu), *Annona neosalicifolia* (aratiku), **Middle stratum:** *Trichilia catigua* (katigua pytã), *Sebastiania* sp.1 (yvyrã kamby), *Holocalyx balansae* (yvyrã pepe), *Averrhoideum paraguayense*, *Chrysophyllum gonocarpum* (aguai), *Maclura tinctoria* ssp. tinctoria (tata jyva), *Sebastiania* sp. 2 (yvyrã kamby), *Samanea tubulosa* (manduvirã), *Parapiptadenia rigida* (kuruap'y rã), *Cupania vernalis* (jagua rata'y pytã), *Genipa americana* (ñandypa guasu), *Ocotea diospyrifolia* (laurel sa'yju) **Lower stratum:** *Picramnia sellowii*, *Casearia gossypiosperma* (mbavy guasu), *Myrcianthes pungens* (guaviju), *Eugenia moraviana*, *Cupania vernalis* (jaguarata'y pytã), *Terminalia triflora* (guajayvi sa'yju), *Trichilia elegans*(katigua'i), *Randia calycina* (ñuatĩ kurusu), *Guarea macrophylla* ssp. *spiciflora* (cedrillo), *Tabernaemontana catharinensis* (sapiranguy), *Casearia sylvestris* (burro ka'a), *Sebastiania* sp.1, *Terminalia triflora* (guajayvi sa'yju), *Parapiptadenia rigida* (kuruap'y rã), *Sorocea sprucei* (María molle) and *Inga uraguensis* (inga guasu).

The **understory** has isolated patches of *Pseudananas sagenarius* (yvira), and *Merostachys clausenii*(takuapi), in addition to *Trichilia elegans* (katigua'i), *Guarea macrophylla* ssp. *spiciflora* (cedrillo) and *Psychotria leiocarpa*. Few lianas were observed, only *Forsteronia glabrescens* (ysypo kamby), the epiphytes present were *Thaumatococcus undulatum* (guembe), *Pleopeltis minima* and *Microgramma vacciniifolia* (anguja ruguai), terrestrial herbaceous like *Geophila repens*, *Pharus lappulaceus*, *Pteris denticulata*, *Adiantopsis radiata* (helecho sombrilla), *Asplenium clausenii*, Cfr. *Hippeastrum* sp. (lirio), *Acalypha* sp.1, and *Desmodium* sp.1.

The formation of this category observed in Soledad, presented as dominant the species of the Poaceae family, with heights of 0.9-1 m and inflorescences of up to 2.5 m. The soil is dark, blackish, humid and in higher parts with wide and deep cracks and traces of burning.

The following were recorded: *Paspalum sp.*, *Lobelia aff. nummularioides*, *Ludwigia hassleriana*, *L. nervosa*, *Rhynchospora spp.*, *Cyperus spp.*, *Lippia sp.*, *Fimbristylis sp.*, *Melochia parvifolia*, *Mikania sp.*, *Acalypha sp. 2*, *Heteropteris sp.*, cfr. *Hymenachne sp.*

In areas with higher topography, the following were recorded: *Stillingia aff. salpingadenia*, *Desmodium sp. 2*, *Oxypetalum sp.*, among other species.

Figure 21 – Riparian forest - Soledad.



Foto: (L. Pérez de Molas)

Figure 22 – Floodplain Savannah in Soledad



Foto: (L. Pérez de Molas)

Natural regeneration is abundant and diverse. They are present *Averrhoideum paraguayense*, *Guibourtia hymenaefolia* (kuruñai), *Salacia elliptica* (pakuri brasileiro), *Chrysophyllum gonocarpum* (aguai), *Trichilia clausenii* (catigua guasu), *Monteverdia ilicifolia* (kangorosa), *Trichilia catigua* (katigua pytã), *Balfourodendron riedelianum* (guatambu), *Rhamnidium elaeocarpum* (taruma'i), *Cupania vernalis* (jagua rata'y pytã).

The soil is sandy, with a lot of organic matter. The stream runs in a box, the water is shallow, forming a ravine of approximately three meters, in some sectors it runs on a rocky bed, forming small rapids. The water is whitish in color.

Relays:

EM2S Coordenadas: 22° 39' 40'' S 57° 12' 4,0'' W, Altitud 213 msnm

EM3S Coordenadas: 22° 39' 52,6'' S 57° 12' 5,3'' W, Altitud 213 msnm

– Riparian Forest San Liberato (Unnamed stream)

Forest 10 m. **Upper stratum:** *Handroanthus impetiginosus* (lapacho rosado), *Copaifera langsdorfii* (kupa'y), *Cordia glabrata* (peterevy morotĩ), *Syagrus romanzoffiana* (pindo), *Handroanthus pulcherrimus* (tajy sa'yju), *Aspidosperma cylindrocarpon* (palo rosa), *Annona neosalicifolia* (aratiku), *Myracrodruon urundeuva* (urunde'y mi), *Albizia niopoides* (yvyra ju), *Aspidosperma australe* (kirandy), *Guibourtia hymenaefolia* (kuruñai) **Middle stratum:** *Casearia gossypiosperma*

(mbavy guasu), *Inga uraguensis* (inga guasu), *Genipa americana* (ñandypa guasu), *Eugenia uniflora* (ñangapiry), *Sapium haemathospermum* (kurupika'y), *Ocotea diospyrifolia* (laurel sa'yju), *Terminalia argentea* (capitán), *Salacia elliptica* (pakuri brasileru), *Miconia* sp., *Protium heptaphyllum* (yvyra ysy), *Machaerium hirtum*, *Garcinia brasiliensis* (pakuri), *Allophylus edulis* (kokũ), *Astronium urundeuva* (urunde'y mi) y *Anadenanthera colubrina* var. *cebil* (kurupa'y kuru) **Lower stratum:** *Parapiptadenia rigida* (kurupa'y rä), *Casearia sylvestris* (burro ka'a), *Celtis iguanaea* (juasy'y), *Cordia sessilis* (asuka revira), *Chrysophyllum marginatum* (pykasu rembi'u), *Sorocea sprucei* ssp. *saxicola* (María molle), *Chomelia obtusa*, *Zanthoxylum rigidum* ssp. *hasslerianum* (tembetary), *Zanthoxylum petiolare* (tembetary morotĩ), *Neea pendulina*, *Myrciaria cuspidata* (typycha ka'aguy) and *Actinostemon conceptionis*.

The **understory** is sparse, the litter completely covering the ground, were recorded *Adiantum latifolium*, *Dorstenia brasiliensis* (tarope), *Scleria* sp., *Anemia* sp., *Pseudananas sagenarius* (yvira), *Hemionitis tomentosa* (doradilla), *Oeceoclades maculata* (orquídea burrito), *Manihot* sp.1, the lianas presentes son *Smilax* sp., *Forsteronia pubescens*, *F. glabrescens* (ysypo kamby), *Lygodium volubile*. Las pocas epífitas están representadas por *Thaumatococcus undulatum* (guembe) and *Tillandsia liliaceae* (clavel del aire).

Relays:

EM1L Coordinates: 22 ° 40 '5.9''S 56 ° 49' 40.1 '' W, Altitude 157 meters above sea level

PO1L Coordinates: 22 ° 40 '5.9''S 56 ° 49' 40.1 '' W, Altitude 157 meters above sea level

– RIPARIAN OR MARGINAL FOREST (BR) Santa Teresa e Zapallo

It generally develops on both banks of a watercourse. It is a forest about 18-20 meters high, with three layers. **Upper stratum:** *Anadenanthera colubrina* var. *cebil* (kurupa'y kuru), *Copaifera langsdorfii* (Kupa'y), *Handroanthus ochraceus* (tajy sa'yju), *Peltophorum dubium* (yvyra pyta), *Inga uraguensis* (inga gusu), *Myracrodruon urundeuva* (urunde'y mi), *Sweetia frundeuticosa* (urunde'y mi) guasu), *Aspidosperma pyriforme* (rosewood), *Guibourtia hymenaeifolia* (kuruñai), *Schefflera morototoni* (amba'y guasu), *Nectandra* aff. *cissiflora* (laurel ne), *Pseudobombax tomentosum* (mandyju ra), *Enterolobium timbouva* (timbo), **Middle stratum:** *Chrysophyllum gonocarpum* (Aguai), *Tapirira guianensis* (ka'a mbota), *Averrhoideum paraguayense*, *Myrtaceae*, *Salacia elliptica* (Pakearuri brazilian) *Gossypiosperma* (mbavy guasu), *Syagrus romanzoffiana* (pindo), *Attalea phalerata* (guacuri), *Protium heptaphyllum* (Yvyra ysy), *Campomanesia xanthocarpa* (guavira pyta), **Lower stratum:** *Genipa americana* (ñandypa guasu), *Cecropia pachystach* *Neea* sp., *Guarea macrophylla* ssp. *spiciflora* (cedar), *Helietta apiculata* (yvyra ovi), *Citrus aurantium* (apepu), *Myrtaceae*, *Coussarea platyphylla*, *Casearia sylvestris* (donkey ka'a), *Gymnanthes discolor*, *Croton urucurana* (dragon's blood), *Garcinia brasiliensis* (pakichuri) *catigua* (catigua pyta), *Trichillia pallida* (katigua moroti) and *Helicteres lhotzkyana*.

Figure 23 – Riparian Forest or marginal foresto n Napegue Stream and bordering a flooded savanna. Santa Teresa. 26.03.2021.



Foto: (L. Pérez de Molas)

Figure 24 – Dry waterbed of Negla'i stream. Zapallo. 29.03.2021

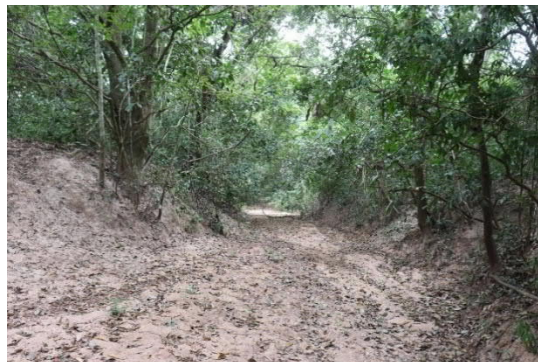


Foto: (L. Pérez de Molas)

On the banks of the Trementina and Hermosa Streams, the presence of tacuarales of *Guadua chacoensis* (takuara) of more than 15 meters in height have been registered.

The undergrowth is sparse. The species present are *Clavija nutans* (*tumby rasy poha*), *Trichilia elegans* (*katigua'i*), *Xylosma venosa* (*ñuati pyta*), *Psychotria carthagenensis*, *Randia spp.* (*ñuati kurusu*), *Epiphytes such as Taumathophyllum undulatum* (*guembe*), *Microgramma persicariifolia*, *Phlebodium decumanum* (*calaguala*), *terrestrial such as Geophila repens*, *Dorsternia cayapia ssp. paraguariensis* (*tarope*) and *Oeceoclades maculata* (*burrito orchid*). Some lianas are *Pisonia aculeata* (*jagua pinda*), *Cissus erosa* (*parral saite*), *Smilax sp.*, *Cardiospermum grandiflorum* (*ysypo kamambu*) and *Paullinia pinnata*. The finding of *Lophophytum mirabile* (*yvoty yvy*), a root parasite registered in the riparian forest of the Negla stream, stands out. The soil is sandy and covered by abundant litter. The ravine is almost vertical about 3 to 4 m high. The Arroyo Negla'i was completely dry.

The presence of large trees cut down and abandoned in the forest of old date, in addition to stumps, was also recorded. Likewise, in the Riparian Forest of Arroyo Hermosa, signs of exploitation were recorded.

Relays:

PO 2 ST Ao. Napegue Coordenadas: 22°36'31.8"S 56°33'08.8"W Altitud 166 msnm

EM 3 ST Ao. Napegue Coordenadas: 22°36'32.0"S 56°33'08.0"W Altitud 174 msnm

PO 1 Z Ao. Negla'i Coordenadas: 22°24'37.3"S 56°32'21.4"W Altitud 191 msnm

PO 1 H Ao. Hermosa Coordenadas: 22°31'08.2"S 56°56'28.8"W Altitud 186 msnm

PO 6 H Ao. Trementina Coordenadas: 22° 24' 45,1S" 56°55' 32,2"W Altitud 184 msnm

EM 5 H Ao. Trementina Coordenadas: 22°31'17.4"S 56°56'52.4"W Altitud 186 msnm

Cerradón (CD)

Is a plant formation characterized as an open semi-deciduous forest, presenting a height of up to 16 m, with three strata, the middle and lower strata being those with the highest density and diversity of species. Most of the tree species are typical of the formation and can also appear in more open formations such as the *Cerrado*. Most of the species are adapted to periodic burning, by presenting thick, corky and cracked bark. The understory is very open, with few epiphytes and lianas. Not much can be observed in the way of natural regeneration of tree species. The soil is sandy, shallow, covered by abundant leaf litter, and with rocky outcrops appearing in certain sectors. Four surveys were carried out in this formation and 92 species were recorded.

Reaches a height of 14 m – 16 m. **Upper stratum:** *Amburana cearensis* (trebol), *Terminalia argentea* (capitán), *Myracrodruon urundeuva* (urunde'y mi), *Dilodendron bipinnatum*, *Enterolobium timbouva* (timbo), *Anadenanthera colubrina* var. *cebil* (kurupa'y kuru), *Pseudobombax tomentosum* (mandyju rã), *Tabebuia aurea* (paratodo), **Middle stratum:** *Averrhoidium paraguayense*, *Magonia pubescens* (yvyra hy'a), *Pseudobombax tomentosum* (mandyju rã), *Cordia americana* (guajayvi), *Acrocomia aculeata* (mbokaja), *Stryphnodendron rotundifolium* (barbatimao), *Myracrodruon urundeuva* (urunde'y mi), *Zanthoxylum caribaeum* ssp. *rugosum* (tembetary hũ), *Casearia gossypiosperma* (mbavy guasu), *Aspidosperma pyrifolium* (palo rosa), *Luehea divaricata* (ka'a ovetĩ) *Sterculia striata*, *Dimorphandra mollis* (lorito pysã), *Trichilia pallens* (katigua morotĩ), *Handroanthus ochraceus* (tajy sa'yju), *Aspidosperma tomentosum* (kirandy del cerrado), *Acrocomia aculeata* (mbokaja), *Syagrus romanzoffiana* (pindo), *Astronium fraxinifolium* var. *glabrum* (urunde'y para morotĩ), *Cecropia pachystachya* (amba'y), *Priogymnanthus hasslerianus* (ka'a vera), *Annona neosalicifolia* (aratiku), *Agonandra brasiliensis*, *Sapium haematospermum* (kurupika'y), *Samanea tubulosa* (manduvi rã), *Helietta apiculata* (yvyra ovi) **Lower stratum:** *Acosmium subelegans*, *Erythroxylon suberosum*, *Rhamnidium elaeocarpum* (taruma'i), *Tabebuia roseo-alba* (tajy morotĩ), *Xylopia aromatica*, *Annona emarginata* (aratiku'i), *Tocoyena formosa*, *Plenckia populnea*, *Luehea divaricata* (ka'a oveti), *Casearia gossypiosperma* (mbavy guasu), *Ocotea minarum*, *Protium heptaphyllum* (yvyra ysy), *Dilodendron bipinnatum* (yvyra ruru), *Myrsine* sp. (kanelon), *Guettarda viburnoides*, *Coussarea platyphylla*, *Astronium fraxinifolium* var. *glabrum* (urunde'y para morotĩ), *Attalea phalerata* (guacuri), *Trichilia stellato-tomentosa*, *Celtis* sp.1 (juasy'y), *Duguetia furfuracea*, *Chrysophyllum marginatum* (pykasu rembi'u).

In the **understory** are present *Smilax* sp. (ju'a peka), *Bromelia balansae* (karaguata), *Bromelia serra* (karaguata), *Scleria* sp., *Piper* sp.2, *Forsteronia glabrescens* (ysypo kamby), *Bauhinia cheilantha*, B. cfr. *mollis*, *Forsteronia pubescens*, *Passiflora* sp.1, *Passiflora* sp.2., *Ruellia angustiflora*, *Croton* sp.4, *Randia calycina* (ñuatĩ kurusu), *Trichilia stellato-tomentosa*, *Dorstenia cayapia* ssp. *paraguariensis* (tarope), *Brosimum gaudichaudi*, *Campomanesia adamantium* (guavira mi), *Lasiacis* sp., *Bulbophyllum* sp., *Trichocentrum morenoi*, *Adiantum serrato-dentatum*, *Odontocarya tamoides* var. *canescens*, *Randia calycina* (ñuatĩ kurusu).

On the edges *Bauhinia* sp., *Prestonia tomentosa*, *Sapium haematospermum* (kurupika'y), *Myrsine* sp. (kanelón), *Jacaranda mimosifolia* (jagaranda), *Lygodium volubile*, *Annona emarginata* (aratiku'i).

Figure 25 – Cerradón - Soledad



Foto: (L. Pérez de Molas)

Figure 26 – Cerradón - San Liberato



Foto: (L. Pérez de Molas)

In the transition from Campo Cerrado to Cerradón, they are present *Cereus stenogonus* (tuna), *Bromeliabalansae* (karaguata), *Acrocomia aculeata* (mbokaja), *Dimorphandra mollis* (lorito pysa), *Agonandra brasiliensis*, *Tocoyena formosa*, *Aspidosperma tomentosum* (kirandy del cerrado), *Pouteria* sp. and *Duguetia furfuracea*,

The regeneration of the species was recorded: *Dilodendron bipinnatum* (yvyra ruru), *Trichilia clausenii* (katigua guasu), *Bauhinia forficata* ssp. *pruinosa* (pata de buey), *Tabebuia roseo-alba* (tajy morotĩ), *Allophylus edulis* (kokũ), *Annona emarginata* (aratiku'i), *Guazuma ulmifolia* (kamba akã), *Cordia americana* (guajayvi), *Anadenanthera colubrina* var. *cebil* (kurupa'y kuru), *Amburana cearensis* (trebol), *Astronium fraxinifolium* var. *glabrum* (urunde'y para morotĩ), *Averrhoidium paraguayense*, *Pseudobombax tomentosum* (mandyju rã), *Syagrus romanzoffiana* (pindo), *Celtis* sp.1 (juasy'y), *Zanthoxylum rigidum* ssp. *hasslerianum* (tembetary), *Myrsine* sp. (kanelón), *Chrysophyllum marginatum* (pykasu rembi'u), *Cupania vernalis* (jagua rata'y pytã), *Trichilia stellato-tomentosa*, *Enterolobium timbouva* (timbo), *Trichilia catigua* (katigua pytã), *Tabebuia aurea* (paratodo), *Salacia elliptica* (pakuri brasileiro).

The soil is sandy, with abundant litter, evidence of fires, invasion of *Megathyrus maximus* (Jack.) B. K. Simon & S.W.L. Jacobs var. *maximus* (colonial pasture) in the clearings.

Relays:

EM5S Coordinates: 22 ° 36 '35.6"S 57 ° 08' 59.2 " W

EM6S Coordinates: 22 ° 36 '24.6''S 57 ° 08' 47.1 '' W, Altitude 263 meters above sea level

EM4L (Isleta) Coordinates: 22 ° 39 '8.9''S 56 ° 52' 8 '' W, Altitude 193 meters above sea level

PO6L (white sand) Coordinates: 22 ° 36 '56.4''S 56 ° 53' 27.4 '' W, Altitude 163 meters above sea level

In Zapallo they are occupying large islets. Open semi-deciduous forest, reaches a height of 15-18 meters, presents three layers: **Upper stratum:** *Astronium fraxinifolium* var. *glabrum* (urunde'y para moroti), *Handroanthus impetiginosus* (lapacho rosado), *Schefflera morototoni* (amba'y guasu), *Peltophorum dubium* (yvyra pyta), *Cordia*

americana (guajayvi), *Magonia pubescens* (yvyra hy'a), *Myracrodruon urundeuva* (urunde'y mi), *Priogymnanthus hasslerianus* (ka'a vera), *Sterculia striata*, *Entrolobium timbouva* (timbo), *Cordia glabrata* (peterevy moroti), *Platypodium elegans*, **Middle stratum:** *Salacia elliptica* (pakuri brasileiro), *Chrysophyllum gonocarpum* (Aguai), *Samanea tubulosa* (manduvira), *Agonandra brasiliensis*, *Dipterys alata*, *Combretum leprosum*, *Tapirira guianensis* (Ka'a mbota), *Acosmium subelegans*, *Protium heptaphyllum* (yvyra ysy), *Terminalia argentea* (capitán), *Guazuma ulmifolia* (kamba aka), *Inga uraguensis* (inga guasu), *Attalea phalerata* (guacuri), *Casearia gossypiosperma* (mbavy guasu), *Ocotea diospyrifolia* (aju'y sa'yju), *Syagrus romanzoffiana* (pindo), *Aspidosperma tomentosum* (kirandy del cerrado), *Acrocomia aculeata* (mbocaja), *Guettarda viburnoides*, *Tabebuia aurea* (paratodo), *Averrhoideum paraguayense*, **Lower stratum:** *Casearia sylvestris* (burro ka'a), *Acrocomia aculeata* (mbokaja), *Genipa americana* (ñandypa guasu), *Tabebuia roseo-alba* (tajy moroti), *Trichilia pallens* (Katigua), *Annona neosalicifolia* (aratiku), *Helicteres lhotzkyana*, *Machaerium acutifolium*.

Figure 27 – Cerradón. Zapallo. 30.03.2021..



Foto: (L. Pérez de Molas)

The understory is sparse, some species present are: *Bredemeyera floribunda*, *Trichilia stellato-tomentosa*, *Tocoyena formosa*, *Trichilia elegans* (catigua'i), *Rhamnidium elaeocarpum* (taruma'i), *Randia spp.* (ñuati kurusu), among others.

The soil is sandy covered by abundant litter.

Fauna burrows and some old log stumps were observed.

Relays:

PO 3 Z Coordenadas: 22° 30' 21,0" S 56° 31' 4,3" W Altitud 183 msnm

PO 4 Z Coordenadas: 22° 31' 59,4" S 56° 36' 15,1" W Altitud 183 msnm

Campo Cerrado (CC)

Is a type of savanna formation, characterized by the dominance of sub-shrub species, with highly developed underground structures. Herbaceous species are present in proportionally lesser quantity and represented, among others, by numerous species of

grasses forming large patches. Evidence of periodic burning was noted. The soil is sandy, the topography is undulating and in certain sectors with rocky outcrops. A single survey was carried out in this formation and 74 species were recorded.

Savanna formation characterized by the dominance of subshrubs with a developed xylopod system, evidence of burns. The soil is sandy, with rocky outcrops (Granite) on the hills. The bedrock is present at a depth of about 10 cm, the terrain slopes steeply to the east.

Dominant species *Campomanesia adamantium* (guavira mi), *Angelonia integerrima*, *Bidens chodatii*, *Butia* sp., *Acrocomia hassleri* (mbokaja'i), *Croton glandulosus*, *Croton* spp., *Rhynchospora setigera*, varias especies de Poaceae y Cyperaceae, *Arachis pflugeae*, *Arachis nitida*, *Cenostigma marginatum*, *Senna paradyction*, *Borreria poya*, *Eryngium sanguisorba*, *Ocimum ovatum*, *Microstachys hispida*, *Ruellia multifolia* var. *viscosissima*, *Aristida* sp., *Abildgaardia ovata*, *Annona dioica* (aratiku), *Oedochloa procurrens*, *Eriosema* sp., *Camptosema* sp., *Passiflora* sp.1, *Psidium* spp., *Cnidocolus albomaculatus*, *Lippia lupulina*, *Ipomoea* spp., *Bulbostylis spheroccephala*, *Evolvulus sericeus*, *Froelichia procera*, *Pouteria* sp., *Bromelia balansae* (karaguata), *Aspilia* sp., *Chrysolea cognata* (jagua rayi), *Ayenia* sp., *Mandevilla petrea*, *M.aff. pohliana*, *Discocactus hartmanii*, *Lippia* sp., *Erythroxylon suberosum*, *E. cuneifolium* (coca del monte), *Buchnera* aff. *longifolia* among others.

Figure 28 – Campo cerrado - Soledad.



Foto: (L. Pérez de Molas)

In San Liberato the predominant presence of *Talisia angustifolia* was recorded in this formation, occupying extensive areas, alternating with isolated bushes of various species of Poacea. In transitional areas with the Cerradón it was also observed, almost pure populations of *Pouteria* sp. y *Cyclolobium brasiliensis* and *Bromelia balansae* (karaguata), como así también regeneración de *Handroanthus ochraceus* (taji sa'yju) and *Sapium haemathospermum* (kurupika'y).

Relief:

EM1S Coordinates: 22 ° 39 '46.7''S 57 ° 12' 11.2 '' W, Altitude 219 meters above sea level

– **Cerrado Field. In Hermosa**

It is a satanic formation characterized by the predominance of shrub and sub-shrub species with important enduring root systems such as xylopods. They generally develop on sandy soils and are subject to periodic burning. Herbaceous species are also present, although to a lesser extent.

Some characteristic species are: *Campomanesia adamantium* (*guavira mi*), *Croton campestris*, *Duguetia furfuracea* (*aratiku*), *Orthopapus angustifolius*, *Vernonantura chamaedrys* (*typycha moroti*), *Anacardium humile* (*kaju'i*), *Talisia angustifolia*, *Eryinustengium ebniifolia*, *Eryinumidium ebniifolia*, *Spermacoce verticillata* (*runner typycha*), *Croton glandulosus*, *Mandevilla petraea*, *Oxalis renifolia*, *Annona dioica* (*aratiku*), *Ayenia tomentosa*, *Arachis* sp., *Desmodium barbatum* (*taha taha*), *Orthopapus angustifolius*, *Mimosa xanthocentra*, *M. juiskeri* *Microstachys hispida*, *Calliandra brevicaulis*, *Turnera grandiflora*, *Psidium* spp., *Allagoptera* sp., *Butia* sp., *Waltheria* sp., *Melochia* sp., *Schizachyrium* sp., *Lygodium venustum*, *L. volubile*, *Indigofera* sp., *Rhynchosia* sp., *Zornia* spp., *Indigofera elegans*, *Ximения intermedia*, *Pterocaulon* spp., *Evolvulus sericeus*, *Aeschynomene* spp., *Adiantum serrato-dentatum*, *Riedeliella graciliflora*, *Cnidocolus albomaculatus* and *Synedrellopsis grisebachii*.

Figure 29 – Cerrado Field in a pastureland of *Urochloa brizantha*. Hermosa. 4.4.2021



Foto: (L. Pérez de Molas)

Figure 30 – Cerrado Field. Hermosa. 4.4.2021



Foto: (L. Pérez de Molas)

The formation is in a degraded state, since at present it is a pasture of *Urochloa brizantha*, in Hermosa, subjected to overgrazing. The Cerrado species that have been recorded in this pasture indicate that the original vegetation has been this one. Other characteristics that add to the degradation are the presence of a lot of bare soil, a network of heavily eroded and compacted trails, traces of periodic burning, abundant cattle droppings, and large anthills. Some active wildlife burrows were also recorded.

Relays:

EM 3 H Coordinates: 22 ° 31'13.6 "S - 56 ° 56'44.0" W Altitude: 171 masl

EM 4 H Coordinates: 22 ° 27'13.3 "S - 56 ° 54'58.5" W Altitude: 215 masl

Dirty Field or Campo Sucio (CS)

Is a phytophysionomy of the *Cerrado*, which also presents a predominance of sub-shrub species forming extensive patches of several individuals, with characteristic species of the formation and some typically ruderal. Evidence of extensive grazing is noted, such as bare and compacted soil. It occupies the higher parts of the terrain, with undulating topography, sandy soils, and with little leaf litter.

In Gavilán, a formation characterized by the presence of species with a maximum height of 1.6 m, bushy vegetation, the soil is sandy, semi-covered with patches of *Paspalum* sp. (Cavaju grass), bushes forming large clumps, shows evidence of entry of cattle and trails.

In San Liberato, with fewer species, evidence of degradation, such as a lot of bare soil, compacted, overgrazed, browsed and traces of burning.

The characteristic species recorded *Talisia angustifolia*, *Anacardium humile* (kaju'i), *Byrsonima* sp., *Pouteria* sp., *Zornia* sp.1, *Annona dioica* (aratiku), *Schinus weinmannifolius* (molle'i), *Duguetia furfurácea* (aratiku hata), *Cnidioscolus albomaculatus*, *Annona nutans* (aratiku ñu), *Campomanesia adamantium* (guavira mi), *Annona emaginata* (aratiku'i), *Syagrus campylospatha* (jata'i mi), *Calliandra brevicaulis* var. *brevicaulis* (niño azote), *Orthopapus angustifolius*, *Adesmia* sp., *Psidium* sp.2, *Tocoyena formosa*, *Croton glandulosus*, *Croton* sp.1, *Forsteronia pubescens*, *F. glabrescens* (ysypo kamby), *Eriosema* sp., *Scoparia dulcis* (typycha kuraty), *Melochia villosa*, *M. parvifolia*, *Spermacoce verticillata* (typycha corredor), *Scleria* sp., *Sida cordifolia* (malva blanca), *Andropogon lateralis* (kapi'i pytã), *Hyptis* spp., *Desmodium* sp.1 (taha taha), *Acisanthera* sp., *Tibouchina* sp., *Pfaffia* sp., *Bromelia balansae* (karaguata), *Evolvulus sericeus*, *Trixis* sp., *Rhynchospora* sp.1, *Arachis nitida*, *Arachis paraguariensis* ssp. *paraguariensis*, *Eupatorium* sp.1, *Angelonia integerrima*, *Mandevilla petrea*, *Bidens gardneri*, *Dorstenia brasiliensis* (tarope), *Paspalum* sp.3(kapi'i pe kavaju) among other.

It is very common to observe the presence of islets in contact with the sabanoid formations. Some characteristic species in these islets are: *Zanthoxylum rigidum* ssp. *hasslerianum* (Tembetary), *Myrsine* sp. (Kanelon), *Chrysophyllum marginatum* (Pykasu rembi'u), *Chomelia obtusa*, *Dimorphandra mollis* (Lorito pysa), *Tabernaemontana catharinensis* (Sapirangy), *Acanthocladus albicans*, *Psidium* sp.1 (Arasa), *Bidens pilosa* (Kapiuna), *Stachytarpheta cayennensis* (Tatu ruguai), *Cestrum* sp., *Solanum* sp., *Spermacoce verticillata* (Typycha corredor), *Melochia parvifolia*, *Mimosa* sp.2 (Jukeri), *Smilax* sp. (Ju'a peka) and in border areas, pure populations of *Bromelia balansae* (Karaguata).

Figure 31 – Campo sucio - Gavilán



Foto: (L. Pérez de Molas)

Figure 32 – Campo sucio -San Liberato



Foto: (L. Pérez de Molas)

Relays:

EM5G Coordenadas: 22° 37' 37,3''S 56° 57' 3,5'' W, Altitud 182 msnm

PO4L Coordenadas: 22° 38' 9,8''S 56° 53' 47,2'' W Altitud: 146 msnm

In Zapallo Phytophysionomy corresponds to a savanna characterized by the presence of subleñosas and herbaceous, mainly, species of Poaceae, Asteraceae, Euphorbiaceae, Fabaceae. The Poaceae cover a large part of the soil surface, with their large clumps. Some species present are *Talisia angustifolia*, *Mandevilla petraea*, *Mimosa debilis* (jukeri), *Spermacoce verticillata* (typycha corredor) *Andropogon lateralis* (kapi'i pyta), *Sida linifolia*, *Pfaffia* sp., *Desmodium barbatum* (taha taha), *Croton glandulosus*, *Microstachys hispida*, *Aeschynomene elegans*, *Oedochloa procurrens*, *Solanum viarum* (mboi rembi'u), *Arachis* sp., *Aristida* sp., *Adiantum serrato-dentatum*, *Ruellia* sp., *Annona dioica* (aratiku), *Hyptis* spp.,

Figure 33 – Dirty field or “Campo sucio” - Zapallo.



Foto: (L. Pérez de Molas)

It develops in high parts of the terrain, with a gentle slope, where islets of different sizes and biodiversity alternate. Some species present on the islets are: *Cordia glabrata* (peterevy moroti), *Machaerium hirtum*, *Sapium haemathospermum* (kurupika'y), *Acosmium subelegans*, *Acrocomia aculeata* (mbokaja), *Tapirira guianensis*

(*camboata*), *Handroanthus Tajtaytaphyns huu* (*aratiku wildebeest*). At the edges of the islets are *Bromelia balansae* (*karaguata*) and *Syagrus campylospatha* (*jata'i mi*).

Relief:

EM 4 Z Coordinates: 22°31'18.5" S - 56°36'35.5" W Altitude 163 msnm

High Savanna (SA)

Is formation occupies the highest parts of the terrain, which are contiguous with forest formations. They present a mainly herbaceous cover with predominance of grasses, mainly *Elionurus muticus* (*Espartillo*) and *Aristida* sp., as well as other herbaceous species and some trees either as isolated individuals or in small groups or patches. They are prone to extensive grazing and periodic burning. The presence of large patches was also recorded, mainly of *Syagrus campylospatha* (*Jata'i mi*). The soil is sandy. A single survey was carried out in this formation and 22 species were recorded.

Non-floodable savanna with dominance of *Elionurus muticus* (*espartillo*), forming large clumps, accompanied by *Aristida* sp., and isolated specimens of *Attalea phalerata* (*guacuri*), *Aspidosperma tomentosum* (*kirandy del cerrado*), *Butia* sp., *Annona dioica* (*aratiku*), *Pouteria* sp., *Talisia angustifolia*, *Sapium haematospermum* (*kurupika'y*), *Syagrus campylospatha* (*jata'i mi*), *Melochia villosa*, *Arachis* spp., *Croton* sp.1.

In some places small islands of *Acrocomia aculeata* (*mbokaja*), *Ocotea diospyrifolia* (*Laurel sa'yju*), *Sapium haematospermum* (*kurupika'y*), *Cereus stenogonus* (*tuna*), *Enterolobium timbouva* (*timbo*), *Cecropia pachystachya* (*amba'y*), *Tocoyena formosa*. The edges are colonized by *Bromelia balansae* (*karaguata*).

Figure 34 – High savanna in San Liberato



Foto: (L. Pérez de Molas)



Foto: (L. Pérez de Molas)

It develops on sandy soils and with higher topography. It shows traces of burning.

Relief:

PO2L Coordinates: 22 ° 38 '57.8''S 56 ° 52' 28.6 '' W, Altitude 177 meters above sea level

In Zapallo and Santa Teresa the formation characterized by a herbaceous stratum with a predominance of Poaceae with large, herbaceous and subleño bushes, alternating with isolated trees of *Acrocomia aculeata* (*mbokaja*), *Machaerium hirtum*, forming small

groups, *Salacia elliptica* (Brazilian pakuri) and shrubs as *Tocoyena formosa*. Likewise, phytophionomy includes islets of different sizes and biodiversity.

Characteristic species: *Elionurus muticus* (espartillo), *Hyptis* spp., *Arachis* spp., *Eupatorium* sp., *Melochia* aff. *pilosa*, *Adiantum serrato-dentatum*, *Lygodium volubile*, *Rhynchospora nervosa*, *Mimosa xanthocentra* (jukeri), *Aeschynomene elegans*, *Chamaecrista* aff. *nictitans*, *Scleria distans*, *Crotalaria maypurensis*, *sauvagesia erecta*, *Pterocaulon alopecuroides*, *Buchnera longifolia*, *Microstachys hispida*, *Zornia* sp., *Bauhinia* sp., *Croton campestris*, *C. andinus*, *Sida linifolia*, *Mimosa debilis* (jukeri), *Chamaecrista flexuosa*, *Mandevilla petraea*, *Schizachirium* sp., *Andropogon selloanus*, *Aristida* sp., *Oedochloa procurrens*, *Lippia* aff. *turnerifolia* var. *turnerifolia*, *Evolvulus sericeus*, *Mimosa dolens* (jukeri), *Polygala linoides*, *Desmodium barbatum* (taha taha), *Stachytarpheta cayennensis* (tatu ruguai), *Acisanthera alsinaefolia*, *Oxalis renifolia*, *Malvastrum coromandelianum*, *Andropogon lateralis* (kapi'i pyta), *Paspalum* spp., *Croton glandulosus*, *Spermacoce verticillata* (typycha corredor).

The species of *Pterocaulon lanatum* and *Sidastrum paniculatum*, *Solanum granulosum-leprosum* (hu'i moneha) are the dominant invasive species in overgrazed and degraded pastures.

The islets have a height of 5 to 8 meters, with arboreal, shrub and herbaceous stratum. The species present are: *Sapium haematospermum* (kurupika'y), *Ocotea diospyrifolia* (aju'y sa'yju), *Zanthoxylum rigidum* ssp. *hasslerianum* (Tembetary), *Casearia sylvestris* (Donkey ka'a), *Chrysophyllum marginatum* (Pykasu rembi'u), *Myrtaceae*, *Handroanthus impetiginosus* (Pink Lapacho), *Genipa americana* (ñandypa guasu), *Handroanthus ochraceus* (Tajinif, *Astronium satronium'yju*) var. *glabrum* (urunde'y para moroti), *Tocoyena formosa*, *Xylosma venosa* (ñuati pyta), *Psidium* spp. (arasa mbaja), *Chomelia obtusa*, *Varronia* sp., *Randia* spp. (ñuati kurusu). The supporting lianas and shrubs are: *Paullinia pinnata* and *Aegiphilla verticillata*. The edges are colonized by *Bromelia balansae* (karaguata).

Figure 35 – High savanna (“espartillar” grasslands). Zapallo. 29.03.2021.

Figure 36 – High savanna. Santa Teresa. 27.03.2021



Foto: (L. Pérez de Molas)



Foto: (L. Pérez de Molas)

They occupy the highest places on the ground. The soil is sandy or clayey and very dry. There are traces of burning, trails and cattle feces.

The pasture with *Urochloa brizantha* pasture has a high density of adult specimens and natural regeneration of *Attalea phalerata* (*guacuri*), *isolated individuals of Sapium haemathospermum* (*kurupika'y*), *Anadenanthera colubrina var. cebil* (*kurupa'y kuru*), *Helieta apiculata* (*yvyra ovi*), *Machaerium aculeatum* (*yvyra tanimbú*), *Luehea divaricata* (*ka'a oveti*), *Ficus sp.* (*handsome'y*), *Lonchocarpus pluvialis*, *Acosmium subelegans*, *Zanthoxylum riedelianum* (*Tembetary sa'yju*), among others.

Relays:

PO 3 ST Coordinates: 22 ° 36'49.4 "S - 56 ° 33'25.5" W Altitude 165 masl

EM 5 ST Coordinates: 22 ° 35'22.0 "S 56 ° 33'51.0" W Altitude 178 masl

EM 8 ST Coordinates: 22 ° 39'25.8 "S 56 ° 41'27.3" W Altitude 163 masl

EM 1 Z Coordinates: 22 ° 25'26.2 "S 56 ° 22'48.1" W Altitude 202 masl

PO 5 H Coordinates: 22 ° 27'03.9 "S 56 ° 54'57.2" W Altitude 215 masl

EM 2 H Coordinates: 22 ° 24'35.6 "S 56 ° 55'04.8" W Altitude 221 masl

Floodable Savanna (SI)

Is formation occupies the lowest parts of the terrain and borders with the forest formations. They present a mainly herbaceous cover with a predominance of grasses forming large patches, as well as other herbaceous aquatic and palustrine plants, and some trees either as isolated individuals or in groups forming small patches. In certain sectors, the presence of large patches, mainly of *Syagrus campylospatha* (*Jata'imi*), were also recorded. At other sites, the presence of isolated individuals of *Copernicia alba* (*Karanda'y*) and *Acrocomia aculeata* (*Mbokaja*) was observed, as well as *Machaerium hirtum* at an arboreal level. Within certain sectors of the localities surveyed, the presence of bodies of water was observed, presumably formed some time ago by the damming of small water courses, and that have since been colonized by aquatic and/or palustrine plant species, either free-floating or bottom-rooted, depending on the depth of the water. Based on the verification of certain evidence, this formation is prone to extensive grazing as well as periodic flooding and burning. Five surveys were carried out in this formation and 114 species were recorded.

In Gavilán, in the *Eucalyptus camaldulensis* plantation area, approximately 10 years old, with grasses of up to 80 cm and woody growing in isolation, up to 2 m. *Pleurophora saccocarpa*, *Ludwigia sp.*, *Echinodorus grandiflorus* (*spoonbill*), *Pontederia cordata* (*camalote*), *Heteropterys sp.*, *Aeschynomene sp. 1*, *Paspalum spp.*, *Eupatorium spp.*, *Eleocharis elegans*, *Aspilia montevidensis*, *Caperonia aff. castaneifolia*, *Cuphea lysimachioides* (*ysypo pere*), *Rhynchospora spp.*, *Melochia simplex* among others.

In similar formation in Gavilán, on gray, humid sandy-clayey soil (fine sand), species of the Poaceae family of the genus *Paspalum sp* were also recorded. growing in large clumps, with inflorescences that reach up to 2.5 m. Other registered species were: *Psidium sp. 3* (*arasa*), *Sisyrinchium sp.*, *Stylosadores sp.*, *Setaria sp.*, *Annona nutans* (*aratiku*), *Rynchospora sp.*, *Oedochloa procurrens*, *Imperata brasiliensis* (*jahape*), *Mimosa spp.* (*jukeri*), *Eleocharis spp.*, *Hyptis spp.*, *Cipura paludosa ssp. boliviensis*, among others.

The presence of trails was observed, surrounded by gallery forest and low forest of 8-10m. Isolated specimens of *Sapium haemathospermum* (*kurupika'y*), *Cecropia pachystachya* (*amba'y*), *Myracrodruon urudeuva* (*regeneration*), *Allophylus edulis*

(kokū), *Schinus weinmannifolius* (molle'i), *Acrocomia aculeguarisia* (jamaica mbokayaata (jambokaya para i).

The formation of this category observed in Soledad, presented as dominant the species of the Poaceae family, with heights of 0.9-1 m and inflorescences of up to 2.5 m. The soil is dark, blackish, humid and in higher parts with wide and deep cracks and traces of burning.

The following were recorded: *Paspalum* sp., *Lobelia* aff. *nummularioides*, *Ludwigia hassleriana*, *L. nervosa*, *Rhynchospora* spp., *Cyperus* spp., *Lippia* sp., *Fimbristylis* sp., *Melochia parvifolia*, *Mikania* sp., *Acalypha* sp. 2, *Heteropteris* sp., cfr. *Hymenachne* sp.

In areas of higher topography, the following were recorded: *Stillingia* aff. *salpingadenia*, *Desmodium* sp. 2, *Oxypetalum* sp., among other species.

In Trementina , the presence of a vegetated lagoon was recorded, with a surface area of 80 x 50 m, whose possible origin was the damming of a water channel. The following bottom-rooted species were surveyed: *Eleocharis elegans* and *Eleocharis* sp. (dominant), patches of *Pontederia azurea* (aguape puru'a); on the edge, but within the water *Utricularia* sp., *Lemna minuta*, *Pontederia cordata* (camalote) and *Nymphoides verrucosa*. *Ludwigia* sp., *Scoparia dulcis* (typycha kuratu), *Phyllanthus niruri* (para'i), *Setaria* sp., *Hymenachne amplexicaule* (camalotillo), *Sida cordifolia* (white mallow), *Polygonum* sp. . (ka'a tai), *Aeschynomene* sp., *Eupatorium* sp. 3.

Figure 37 – Floodplain Savanna in Soledad



Foto: (L. Pérez de Molas)

Figure 38 – Marsh aquatic vegetation in body of water in Trementina



Foto: (L. Pérez de Molas)

In places with higher topography, *Sapium haematospermum* (kurupika'y), *Cecropia pachystachya* (amba'y), *Sorocea sprucei* ssp. *saxicola* (Maria molle), *Tocoyena formosa*, *Acrocomia aculeata* (mbokaja), *Vitex cymosa* (taruma), *Ocotea diospyrifolia* (Laurel sa'yju), *Bromelia balansae* (karaguata).

– **FLOODABLE SAVANNA WITH FOREST ISLANDS In Santa Teresa**

It is characterized by presenting a dominant herbaceous layer formed mainly by Poaceae and Cyperaceae species growing in large clumps and often reaching a height of more than 1 meter. The characteristic species are: *Cyperus giganteus* (piri guasu), *Paspalum intermedium*, *Aeschynomene* aff. *americana*, *A. elegans*, *Pontederia cordata* (kamalote), *Byttneria* sp., *Vernonantura brasiliiana*, *Commelina diffusa* (santa lucia hovy), *Acalypha* sp., *Ludwigia nervosa*, *L. filiformis*, *L. hassleriana*, *L. sericea*, *Cuphea*

lysimachioides (ysypo pere), *Rhynchospora* spp., *Hetropterys glabra*, *Melochia parvifolia*, *Acisanthera alsinaefolia*, *Tibouchina* sp., *Schultesia* sp., *Nymphoides indica*, *Echinodorus* sp., *Sauvagesia erecta*, *Angelonia integerrima*, *A. salicarifolia*, *Polygala linoides* var. *linoides*, *P. molluginifolia*, *Lippia* aff. *turnerifolia* var. *turnerifolia*, *Stemodia* spp., *Corchorus argutus*, *Cipura paludosa* ssp. *boliviensis*, *Cantinoa althaeifolia*, *Hydrolea elatior*, *Caperonia* aff. *castaneifolia*, *C. palustris*, *Lessingianthus rubricaulis*, *Campuloclinium macrocephalum*, *Eryngium ebracteatum*, *Justicia laevilinguis*, *Schizachyrium* spp., *Eleocharis* spp., *Polygonum* spp. Among the lianas stand out *Mikania* sp. y *Rhabdadenia ragonesei*.

They occupy the intermediate altitude zones between the high savanna and the flooded savanna. The soil is clayey, dark, with abundant organic matter, and they suffer floods (September to November) and periodic burns, mainly in the autumn-winter.

In the lower areas, and with permanent water, there appear almost pure populations of *Thaumatococcus undulatum* (guembe) and species of Poaceae (Kapi'i pe'y) and Cyperaceae, such as *Cyperus giganteus* (piri guasu). In some places isolated specimens of *Sesbania exasperata*, *Machaonia brasiliensis* and *Helicteres gardneriana* are present.

These areas also represent paddocks with implanted pastures of *Urochloa humidicola*.

Presents evidence of degradation such as deep tracks, heavily eroded trails, and cattle droppings. They are breeding paddocks, with permanent load.

Alternating with the flooded savanna and in higher places, almost always with the presence of one to three ant hills with their respective burrows, are the islets, with variable shape, size and biodiversity, characterized by floristic elements of the cerradones such as *Dipteryx alata*, *Dilodendron bipinatum*, *Xylopia brasiliensis*, *Acrocomia aculeata* (mbokaja), *Sapium haematospermum* (kurupika'y), *Acosmium subelegans*, *Guibourtia hymenaeifolia* (kuruñai), *Handroanthus impetiginosus* (lapacho rosado), *Sorocea sprucei* (maria molle), *Copaifera langsdorfii* (kupa'y), *Machaerium hirtum*, *Astronium fraxinifolium* var. *glabrum* (urunde'y para moroti), *Anadenanthera peregrina* (kurupa'y ita), *Aspidosperma quebracho-blanco* (quebracho blanco), *Sideroxylon obtusifolium* (guajayvi rai), *Ocotea diospyrifolia* (aju'y sa'yju), *Cereus stenogonus* (tuna). Los arbolitos y arbustos presentes son *Randia* spp. (ñuati kurusu), *Myrsine* sp. (kanelón), *Genipa americana* (ñandypa guasu), *Monteverdia ilicifolia* (kangorosa), *Casearia sylvestris* (burro ka'a), *Tabernaemontana catharinensis* (sapiranguy), *Tocoyena formosa*, *Psidium* spp., *Cestrum* sp., *Trichilia stellatomentosa*, *Celtis* sp. (juasy'y), *Xylosma venosa* (ñuati pyta), *Melochia* sp., *Scleria* sp. Among the lianas, *Forsteronia glabrescens* and *F. pubescens* (ysypo kamby), *Paullinia pinnata*, *Smilax* sp., *Tanaecium* sp., *Bonamia* aff. *subsessilis*, *Janusia guaranitica*, *Smilax* sp., *Passiflora cincinnata* (mburucuja), among others. The edges are generally colonized by *Bromelia balansae* (karaguata) and *Stachytarpheta cayennensis* (tatu ruguai).

Figure 39 – Flooded savanna. Santa Teresa. 28.03.2021.



Foto: (L. Pérez de Molas)

Relays

EM 4 ST Coordinates: 22 ° 36'29.2 "S 56 ° 33'14.6" W Altitude 166 masl

EM 6 ST Coordinates: 22 ° 38'27.9 "S 56 ° 39'00.8" W Altitude 172 masl

EM 7 ST Coordinates: 22 ° 39'39.8 "S 56 ° 37'48.0" W Altitude 168 masl

EM 2 Z Coordinates: 22 ° 31'33.5 "S 56 ° 32'32.6" W Altitude 187 masl

EM 1 H Coordinates: 22 ° 28'02.1 "S 56 ° 57'41.8" W Altitude 218 masl

PO 3 H Coordinates: 22 ° 27'39.5 "S 56 ° 57'29.7" W Altitude 216 masl

PO 7 H Coordinates: 22 ° 24'55.8 "S 56 ° 53'52.8" W Altitude 187 masl

In San Liberato the formation that is characterized by being subjected to floods, periodic burning and extensive grazing. The dominant species in the upper stratum is *Copernicia alba* (karanda'y) (Fig. 21), accompanied by very isolated individuals of *Acrocomia aculeata* (Mbokaja), *Machaerium hirtum*, *Peltophorum dubium* (yvyra pytã), *Copaifera langsdorfii* (kupa'y) , *Terminalia triflora* (guajayvi sa'yju), *Sapium haematospermum* (kurupika'y), *Zanthoxylum hirtum* ssp. *hassleri* (Tembetary), *Cereus stenogonus* (Prickly Pear), *Tocoyena formosa*. In some sectors, pure populations of *Talisia angustifolia*, *Bromelia balansae* (karaguata), *Syagrus campylospatha* (jata'i mi), *Annona nutans* (aratiku), *Thaumatococcus undulatum* (guembe) and *Annona dioica* (aratiku) were observed.

Figure 40 – Sabana inundable de *Copernicia alba* en San Liberato.



Foto: (L. Pérez de Molas)

The herbaceous stratum is continuous and dominated by several species of the Poaceae family, including *Aristida* sp., In particular the presence of several species and *Arachis* spp.

Relays:

PO1G Coordinates: 22 ° 39 '00''S 56 ° 54' 35.5 '' W, Altitude 148 meters above sea level

EM4S Coordinates: 22 ° 38 '31.8''S 57 ° 11' 45.4 '' W, Altitude 231 meters above sea level

EM1G Coordinates: 22 ° 40 '15''S 56 ° 54' 00.0 '' W, Altitude 138 meters above sea level

PO2T Coordinates: 22 ° 43 '54.7''S 56 ° 54' 3.0 '' W, Altitude 153 meters above sea level

PO3L Coordinates: 22 ° 38 '28.2''S 56 ° 53' 36.8 '' W, Altitude 158 meters above sea level

FLODDED SAVANNA WITH “EMBALSADO” (SIn) In Zapallo

It constitutes a large wetland characterized by the dominance of few species, including Cyperaceae and Fabaceae, mainly *Aeschynomene* aff. *americana* growing in isolation. It has permanent water and an organic substrate that produces movement when walking on it. Some species also registered are: *Eleocharis* spp.; *Utricularia* spp., *Hibiscus sororius*, *Ludwigia nervosa*, *Nymphoides indica*, *Pontederia* aff. *subovata*.

Figure 41 – Flooded savanna with “embalsado”. Zapallo. 30.03.2021.



Foto: (L. Pérez de Molas)

EMBALSADO In Zapallo

Inserts in a few sectors are dammed from 10 to 15 meters in diameter, colonized mainly by woody plants of the Onagraceae, Fabaceae and Malvaceae families. Some recorded species are *Habenaria* aff. *repens*, *Mayaca sellowiana*, *Myrsine* sp., *Cecropia pachystachya* (amba’y), *Bacopa* aff. *salzmannii*, Pteridophyta, Melastomataceae, *Xyris* sp., *Hydrolea* aff. *spinosa* var. *paraguayensis*.

Figure 42 – Dammed in Sabana Inundada. Zapallo. 30.03.2021.



Foto: (L. Pérez de Molas)

Relief:

PO2 Z Coordinates: 22 ° 30'24.5 "S 56 ° 30'58.2" W Altitude 211 masl

AQUATIC VEGETATION IN WATER BODIES

In the bodies of water of variable size and depth, and dispersed in all the study sites, established mainly for livestock consumption, the aquatic-marsh vegetation develops, among which amphibians, rooted in the bottom and the free floating. Some registered

species are: *Eleocharis* spp., *Pontederia azurea* (aguape), *Nymphoides indica*, *Limnocharis flava*, *Hydrocleys nymphoides*, *Ludwigia nervosa*, *Gymnocoronis spilantoides*, *Marsilea* sp. Almost pure populations of *Polygonum* spp. Develop at the edges, among others.

Figure 43 – Laguna. Zapallo. 29.03.2021.

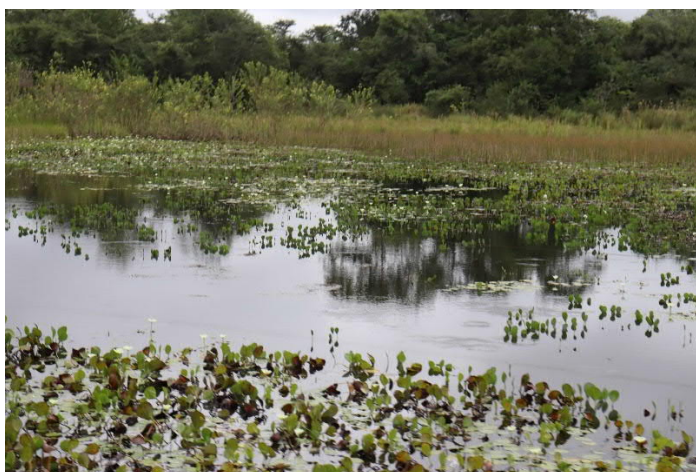


Foto: (L. Pérez de Molas)

Table 7 – List of species with common names and conservation status

N°	Taxa	Especie	Common Names *	MAD ES	CITES	IUCN
PTERIDOPHYTA						
1	Psilotaceae	<i>Psilotum nudum</i> (L.) P. Beauv.				
2	Anemiaceae	<i>Anemia</i> sp.				
3	Aspleniaceae	<i>Asplenium clausenii</i> Hieron.				
4	Lygodiaceae	<i>Lygodium venustum</i> Sw.				
5	Lygodiaceae	<i>Lygodium volubile</i> Sw.				
6	Marsileaceae	<i>Marsilea</i> sp.				
7	Polypodiaceae	<i>Microgramma persicariifolia</i> (Schrad.) C. Presl.				
8	Polypodiaceae	<i>Microgramma vacciniifolia</i> (Langsd. & Fisch.) Copel.	Anguja ruguai			
9	Polypodiaceae	<i>Phlebodium decumanum</i> (Willd.) J. Sm.	kalaguala			
10	Polypodiaceae	<i>Pleopeltis minima</i> (Bory) J. Prado & R.Y. Hirai				
11	Polypodiaceae	<i>Polypodium</i> sp.				
12	Pteridaceae	<i>Adiantopsis radiata</i> (L.) Fée	Helecho sombrilla			
13	Pteridaceae	<i>Adiantum latifolium</i> Lam.				
14	Pteridaceae	<i>Adiantum serrato-dentatum</i> Humb. & Bonpl. ex Willd.				
15	Pteridaceae	<i>Doryopteris pentagona</i> Pic. Serm.				
16	Pteridaceae	<i>Doryopteris</i> sp.				
17	Pteridaceae	<i>Hemionitis tomentosa</i> (Lam.) Raddi	Doradilla	EN		
18	Pteridaceae	<i>Pteris denticulata</i> Sw. var. <i>denticulata</i>				
19	Selaginellaceae	<i>Selaginella sellowii</i> Hieron.	pasto de monte			
20	Selaginellaceae	<i>Selaginella</i> sp.				
21	Pteridophyta	Morfoespecie				
MONOCOTYLEDONAE						
22	Alismataceae	<i>Echinodorus grandiflorus</i> (Cham. & Schtdl.) Micheli	Cucharero			

N°	Taxa	Especie	Common Names *	MAD ES	CITES	IUCN
23	Alismataceae	<i>Echinodorus</i> sp.				
24	Alismataceae	<i>Hydrocleys nymphoides</i> (Willd.) Buchenau				
25	Alismataceae	<i>Limnocharis flava</i> (L.) Buchenau				
26	Amaryllidaceae	Cfr. <i>Hippeastrum</i> sp.	Lirio			
27	Araceae	<i>Lemna minuta</i> Kunth				
28	Araceae	<i>Thaumatococcus danianus</i> (Engl.) Sakur., Calazans & Mayo	Guembe			
29	Arecaceae	<i>Acrocomia aculeata</i> (Jacq.) Lodd. ex Mart.	mbokaja			
30	Arecaceae	<i>Acrocomia hassleri</i> (Barb. Rodr.) W.J. Hahn	Mbokaja'i	AE		
31	Arecaceae	<i>Allagoptera</i> sp.				
32	Arecaceae	<i>Attalea phalerata</i> Mart. ex Spreng.	Guacuri			
33	Arecaceae	<i>Bactris glaucescens</i> Drude	Karanda	EN		LC
34	Arecaceae	<i>Butia paraguayensis</i> (Barb. Rodr.) L.H. Bailey	Jata'i			
35	Arecaceae	<i>Butia</i> sp.				
36	Arecaceae	<i>Copernicia alba</i> Morong	karanda'y			
37	Arecaceae	<i>Syagrus campylospatha</i> (Barb. Rodr.) Becc.	yatay mi	AE		
38	Arecaceae	<i>Syagrus oleracea</i> (Mart.) Becc.	guaviroba	EN		
39	Arecaceae	<i>Syagrus romanzoffiana</i> (Cham.) Glassman	pindo			
40	Bromeliaceae	<i>Bromelia balansae</i> Mez	Karaguata			
41	Bromeliaceae	<i>Bromelia serra</i> Griseb.	Karaguata			
42	Bromeliaceae	<i>Pseudananas sagenarius</i> (Arruda) Camargo	yvira, Kuantu purã			
43	Bromeliaceae	<i>Tillandsia loliacea</i> Mart. ex Schult. f.	Clavel del aire			
44	Bromeliaceae	<i>Tillandsia</i> sp.				
45	Commelinaceae	<i>Commelina erecta</i> L.	Santa lucia hovy			
46	Commelinaceae	<i>Commelina</i> sp.				
47	Cyperaceae	<i>Abildgaardia ovata</i> (Burm.f.) Kral				
48	Cyperaceae	<i>Bulbostylis sphaerocephala</i> (Boeck.) Lindm.				
49	Cyperaceae	<i>Bulbostylis</i> sp.				
50	Cyperaceae	<i>Cyperus giganteus</i> Vahl.	piri guasu			
51	Cyperaceae	<i>Cyperus sesquiflorus</i> (Torr.) Mattf. & Kük ex Kük				
52	Cyperaceae	<i>Cyperus surinamensis</i> Rottb.				
53	Cyperaceae	<i>Cyperus</i> sp.1				
54	Cyperaceae	<i>Cyperus</i> sp.2				
55	Cyperaceae	<i>Cyperus</i> sp.3				
56	Cyperaceae	<i>Cyperus</i> sp.4				
57	Cyperaceae	<i>Cyperus</i> sp.5				
58	Cyperaceae	<i>Cyperus</i> sp.6				
59	Cyperaceae	<i>Eleocharis elegans</i> (Kunth) Roem. & Schult.				
60	Cyperaceae	<i>Eleocharis</i> aff. <i>plicarhachis</i> (Griseb.) Svenson				
61	Cyperaceae	<i>Eleocharis</i> sp.1				
62	Cyperaceae	<i>Eleocharis</i> sp.2				
63	Cyperaceae	<i>Fymbristylis</i> sp.1				
64	Cyperaceae	<i>Fymbristylis</i> sp.2				
65	Cyperaceae	<i>Rhynchospora albiceps</i> Kunth				
66	Cyperaceae	<i>Rhynchospora nervosa</i> (Vahl.) Boeck.				
67	Cyperaceae	<i>Rhynchospora setigera</i> (Kunth) Boeck.				
68	Cyperaceae	<i>Rhynchospora</i> sp.1				
69	Cyperaceae	<i>Rhynchospora</i> sp.2				
70	Cyperaceae	<i>Rhynchospora</i> sp.3				
71	Cyperaceae	<i>Rhynchospora</i> sp.4				
72	Cyperaceae	<i>Rhynchospora</i> sp.5				
73	Cyperaceae	<i>Rhynchospora</i> sp.6				
74	Cyperaceae	<i>Scleria distans</i> Poir.	Kapi'i katî estero			LC
75	Cyperaceae	<i>Scleria</i> sp.1				
76	Cyperaceae	<i>Scleria</i> sp.2				
77	Cyperaceae	Morfoespecie 1				
78	Cyperaceae	Morfoespecie 2				
79	Cyperaceae	Morfoespecie 3				

N°	Taxa	Especie	Common Names *	MAD ES	CITES	IUCN
80	Cyperaceae	Morfoespecie 4				
81	Cyperaceae	Morfoespecie 5				
82	Cyperaceae	Morfoespecie 6				
83	Cyperaceae	Morfoespecie 7				
84	Cyperaceae	Morfoespecie 8				
85	Cyperaceae	Morfoespecie 9				
86	Cyperaceae	Morfoespecie 10				
87	Cyperaceae	Morfoespecie 11				
88	Heliconiaceae	<i>Heliconia</i> aff. <i>hirsuta</i> L.f.				
89	Iridaceae	<i>Cipura paludosa</i> Aubl. ssp. <i>boliviensis</i> Ravenna				
90	Iridaceae	<i>Sisyrinchium</i> sp.				
91	Mayacaceae	<i>Mayaca sellowiana</i> Kunth				
92	Orchidaceae	<i>Bulbophyllum</i> sp.			II	
93	Orchidaceae	<i>Campylocentrum</i> cfr. <i>neglectum</i> (Rchb. f. & Warm.) Cogn.			II	
94	Orchidaceae	<i>Habenaria</i> aff. <i>repens</i> Nutt.			II	
95	Orchidaceae	<i>Oeceoclades maculata</i> (Lindl.) Lindl.	Orquídea burrito		II	LC
96	Orchidaceae	<i>Trichocentrum cebolleta</i> (Jacq.) M.W. Chase & N.H. Williams	Orquídea		II	
97	Orchidaceae	<i>Trichocentrum morenoi</i> (Dodson & Luer) M.W. Chase & N.H. Williams	Orquídea		II	
98	Orchidaceae	Morfoespecie			II	
99	Poaceae	<i>Andropogon bicornis</i> L.	Aguara Ruguai, Cola de Zorro			
100	Poaceae	<i>Andropogon lateralis</i> Nees	kapi'i pytä			
101	Poaceae	<i>Andropogon selloanus</i> (Hack.) Hack.				
102	Poaceae	<i>Andropogon</i> sp.1				
103	Poaceae	<i>Andropogon</i> sp.2				
104	Poaceae	<i>Aristida</i> sp.1				
105	Poaceae	<i>Aristida</i> sp.2				
106	Poaceae	<i>Axonopus</i> sp.				
107	Poaceae	<i>Elionurus muticus</i> (Spreng.) Kuntze	Espartillo guasu			
108	Poaceae	<i>Eustachys</i> sp.				
109	Poaceae	<i>Gouinia brasiliensis</i> (S. Moore) Swallen				
110	Poaceae	<i>Guadua chacoensis</i> (Rojas) Londoño & P.M. Peterson	Takuara			
111	Poaceae	<i>Hymenachne amplexicaulis</i> (Rudge) Nees	Camalotillo			
112	Poaceae	cfr. <i>Hymenachne</i> sp.				
113	Poaceae	<i>Imperata brasiliensis</i> Trin.	Jahape			
114	Poaceae	<i>Lasiacis sorghoidea</i> (Desv. ex Ham.) Hitchc. & Chase				
115	Poaceae	<i>Lasiacis</i> sp.				
116	Poaceae	<i>Merostachys claussenii</i> Munro	Takuapi			
117	Poaceae	<i>Ocellochloa stolonifera</i> (Poir.) Zuloaga & Morrone				
118	Poaceae	<i>Oedochloa procurrens</i> (Nees ex Trin.) C. Silva & R.P. Oliveira				
119	Poaceae	Cfr. <i>Pappophorum</i> sp.				
120	Poaceae	<i>Paspalum</i> aff. <i>intermedium</i> Munro ex Morong & Britton				
121	Poaceae	<i>Paspalum</i> sp.1				
122	Poaceae	<i>Paspalum</i> sp.2				
123	Poaceae	<i>Paspalum</i> sp.3	Kap'ipe kavaju			
124	Poaceae	<i>Paspalum</i> sp.4				
125	Poaceae	<i>Paspalum</i> sp.5				
126	Poaceae	<i>Paspalum</i> sp.6				
127	Poaceae	<i>Pharus lappulaceus</i> Aubl.	Ka'i arro			
128	Poaceae	<i>Schizachyrium</i> sp.1	Aguara ruguai			
129	Poaceae	<i>Schizachyrium</i> sp.2				

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130	Poaceae	<i>Setaria</i> sp.1				
131	Poaceae	<i>Setaria</i> sp.2				
132	Poaceae	<i>Setaria</i> sp.3				
133	Poaceae	<i>Urochloa brizantha</i> (Hochst. ex A. Rich.) R.D. Webster				
134	Poaceae	<i>Urochloa humidicola</i> (Rendle) Morrone & Zuloaga				
135	Poaceae	Morfoespecie 1				
136	Poaceae	Morfoespecie 2				
137	Poaceae	Morfoespecie 3				
138	Poaceae	Morfoespecie 4				
139	Poaceae	Morfoespecie 5				
140	Poaceae	Morfoespecie 6				
141	Poaceae	Morfoespecie 7				
142	Poaceae	Morfoespecie 8				
143	Poaceae	Morfoespecie 9				
144	Poaceae	Morfoespecie 10				
145	Poaceae	Morfoespecie 11				
146	Poaceae	Morfoespecie 12				
147	Poaceae	Morfoespecie 13				
148	Pontederiaceae	<i>Pontederia</i> aff. <i>subovata</i> (Seub.) Lowden				
149	Pontederiaceae	<i>Pontederia azurea</i> Sw.	Aguape puru'a			
150	Pontederiaceae	<i>Pontederia cordata</i> L. var. <i>cordata</i>	Camalote			
151	Smilacaceae	<i>Smilax campestris</i> Griseb. (isleta)	Ju'a peka			
152	Smilacaceae	<i>Smilax</i> sp.1				
153	Smilacaceae	<i>Smilax</i> sp.2				
154	Xyridaceae	<i>Xyris</i> sp.				
DICOTYLEDONAE						
155	Acanthaceae	<i>Justicia brasiliana</i> Roth				
156	Acanthaceae	<i>Justicia laevilinguis</i> (Nees) Lind.				
157	Acanthaceae	<i>Ruellia</i> aff. <i>tweediana</i> Griseb.				
158	Acanthaceae	<i>Ruellia angustiflora</i> (Nees) Lindau ex Rambo	Mainumby kaaguyjy			
159	Acanthaceae	<i>Ruellia multifolia</i> (Nees) Lindau var. <i>viscosissima</i> Nees) C. Ezcurra				
160	Acanthaceae	<i>Ruellia</i> sp.1				
161	Acanthaceae	<i>Ruellia</i> sp.2				
162	Amaranthaceae	<i>Froelichia procera</i> (Seub.) Pedersen	Mil poha			
163	Amaranthaceae	<i>Pfaffia</i> sp.1				
164	Amaranthaceae	<i>Pfaffia</i> sp.2				
165	Anacardiaceae	<i>Anacardium humile</i> A. St.-Hil.	kaju'i			
166	Anacardiaceae	<i>Astronium fraxinifolium</i> Schott var. <i>glabrum</i> Engl.	urunde'y para moroti			
167	Anacardiaceae	<i>Astronium</i> sp.				
168	Anacardiaceae	<i>Myracrodruon urundeuva</i> Allemão	Urunde'y mi			
169	Anacardiaceae	<i>Schinus weinmannifolius</i> Engl.	Molle'i			
170	Anacardiaceae	<i>Tapirira guianensis</i> Aubl.	ka'ambota			
171	Annonaceae	<i>Annona dioica</i> A. St.-Hil.	Aratiku ñu			LC
172	Annonaceae	<i>Annona emarginata</i> (Schltdl.) H. Rainer	Aratiku'i			
173	Annonaceae	<i>Annona neosalicifolia</i> H. Rainer	Aratiku'i			LC
174	Annonaceae	<i>Annona nutans</i> (R.E. Fr.) R.E. Fr.	Aratiku ñu			LC
175	Annonaceae	<i>Duguetia furfuracea</i> (A. St.-Hil.) Benth. & Hook. f.	Aratiku hata			LC
176	Annonaceae	<i>Xylopia aromatica</i> (Lam.) C. Mart.	ka'i pimienta			LC
177	Apiaceae	<i>Eryngium ebracteatum</i> Lam.				
178	Apiaceae	<i>Eryngium sanguisorba</i> Cham. & Schltdl.				
179	Apocynaceae	<i>Aspidosperma australe</i> Müll. Arg.	Kirandy			
180	Apocynaceae	<i>Aspidosperma cylindrocarpon</i> Müll. Arg.	Palo rosa			LC
181	Apocynaceae	<i>Aspidosperma pyriforme</i> C. Mart.	Palo rosa			LC
182	Apocynaceae	<i>Aspidosperma quebracho-blanco</i> Schltdl.	quebracho blanco			

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183	Apocynaceae	<i>Aspidosperma quirandy</i> Hassl. var. <i>quirandy</i>	kirandy			
184	Apocynaceae	<i>Aspidosperma tomentosum</i> C. Mart.	kirandy del cerrado			LC
185	Apocynaceae	<i>Forsteronia glabrescens</i> Müll. Arg.	ysypo kamby			
186	Apocynaceae	<i>Forsteronia pubescens</i> A.DC.				
187	Apocynaceae	<i>Mandevilla</i> aff. <i>pohliana</i> (Stadelm.) A.H. Gentry				
188	Apocynaceae	<i>Mandevilla petraea</i> (A. St.-Hil.) Pichon				
189	Apocynaceae	<i>Mandevilla undulata</i> (C. Ezcurra) A.O. Simões, Kin.-Gouv. & M.E. Endress				
190	Apocynaceae	<i>Oxypetalum</i> sp.				
191	Apocynaceae	<i>Prestonia coalita</i> (Vell.) Woodson				
192	Apocynaceae	<i>Prestonia tomentosa</i> R. Br.				
193	Apocynaceae	<i>Rhabdadenia ragonesei</i> Woodson				
194	Apocynaceae	<i>Schubertia grandiflora</i> Mart.	Paraguayita			
195	Apocynaceae	<i>Tabernaemontana catharinensis</i> A. DC.	Sapirangy			LC
196	Apocynaceae	Morfoespecie 1				
197	Apocynaceae	Morfoespecie 2				
198	Araliaceae	<i>Didymopanax morototoni</i> (Aubl.) Decne. & Planch.	Amba'y guasu			
199	Asteraceae	<i>Aspilia montevidensis</i> (Spreng.) Kuntze				
200	Asteraceae	<i>Aspilia</i> sp.1				
201	Asteraceae	<i>Aspilia</i> sp.2				
202	Asteraceae	<i>Aspilia</i> sp.3				
203	Asteraceae	<i>Bidens chodatii</i> Hassl. ENDEMIC				
204	Asteraceae	<i>Bidens gardneri</i> Baker				
205	Asteraceae	<i>Bidens pilosa</i> L.	kapiuna			
206	Asteraceae	<i>Calea triantha</i> (Vell.) Pruski				
207	Asteraceae	<i>Campuloclinium macrocephalum</i> (Less.) DC.				
208	Asteraceae	<i>Chaptalia</i> sp.				
209	Asteraceae	<i>Chrysolea cognata</i> (Less.) Dematteis	Jagua rayi			
210	Asteraceae	<i>Dasyphyllum brasiliense</i> (Spreng.) Cabrera var. <i>brasiliense</i>	Ñurí			
211	Asteraceae	<i>Dasyphyllum</i> sp.				
212	Asteraceae	<i>Elephantopus mollis</i> Kunth				
213	Asteraceae	<i>Elephantopus</i> aff. <i>palustris</i> Gardner				
214	Asteraceae	<i>Eupatorium variegatum</i> Malme				
215	Asteraceae	<i>Eupatorium</i> sp.1				
216	Asteraceae	<i>Eupatorium</i> sp.2				
217	Asteraceae	<i>Eupatorium</i> sp.3				
218	Asteraceae	<i>Eupatorium</i> sp.4				
219	Asteraceae	<i>Eupatorium</i> sp.5				
220	Asteraceae	<i>Gymnocoronis spilantoides</i> (D. Don ex Hook. & Arn.) DC.				
221	Asteraceae	<i>Lessingianthus rubricaulis</i> (Bonpl.) H. Rob.				
222	Asteraceae	<i>Mikania</i> sp.				
223	Asteraceae	<i>Moquiniastrum</i> sp.				
224	Asteraceae	<i>Orthopapus angustifolius</i> (Sw.) Gleason				
225	Asteraceae	<i>Pluchea sagittalis</i> (Lam.) Cabrera	yerba de lucero			
226	Asteraceae	<i>Porophyllum ruderale</i> (Jacq.) Cass.	yryvu retyma			
227	Asteraceae	<i>Pterocaulon alopecuroides</i> (Lam.) DC.				
228	Asteraceae	<i>Pterocaulon lanatum</i> Kuntze				
229	Asteraceae	<i>Pterocaulon rugosum</i> (Vahl) Malme				
230	Asteraceae	<i>Solidago chilensis</i> Meyen	Mbu'y sa'yju			
231	Asteraceae	<i>Synedrellopsis grisebachii</i> Hieron. & Kuntze ex Kuntze				
232	Asteraceae	<i>Trixis</i> sp.				
233	Asteraceae	<i>Vernonanthura chamaedrys</i> (Less.) H. Rob.	Typycha moroti			
234	Asteraceae	<i>Vernonanthura brasiliana</i> (L.) H. Rob.				
235	Asteraceae	<i>Vernonia</i> sp.1				

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236	Asteraceae	<i>Vernonia</i> sp.2				
237	Asteraceae	<i>Vernonia</i> sp.3				
238	Asteraceae	cfr. <i>Vernonia</i> sp.				
239	Asteraceae	Morfoespecie 1				
240	Asteraceae	Morfoespecie 2				
241	Balanophoraceae	<i>Lophophytum mirabile</i> Schott & Endl.	yvoty yvy			
242	Bignoniaceae	<i>Amphilophium paniculatum</i> (L.) Kunth				
243	Bignoniaceae	<i>Handroanthus heptaphyllus</i> (Vell.) Mattos	tajy hu	EN		LC
244	Bignoniaceae	<i>Handroanthus impetiginosus</i> (Mart. ex DC.) Mattos	Lapacho rosado			LC
245	Bignoniaceae	<i>Handroanthus ochraceus</i> (Cham.) Mattos ssp. <i>ochraceus</i>	Tajy sa'y ju	AE		
246	Bignoniaceae	<i>Handroanthus pulcherrimus</i> (Sandwith) S. Grose	Tajy sa'yju	AE		
247	Bignoniaceae	<i>Jacaranda mimosifolia</i> D. Don	Jakaranda			
248	Bignoniaceae	<i>Sparattosperma leucanthum</i> (Vell.) K. Schum.	caroba blanca (Br.)			
249	Bignoniaceae	<i>Tabebuia aurea</i> (Silva Manso) Benth. & Hook. f. ex S. Moore	Paratodo			
250	Bignoniaceae	<i>Tabebuia roseo-alba</i> (Ridl.) Sandwith	Lapacho blanco			
251	Bignoniaceae	<i>Tanaecium</i> sp.				
252	Boraginaceae	<i>Cordia americana</i> (L.) Gottschling & J.S. Mill.	Guajayvi			
253	Boraginaceae	<i>Cordia glabrata</i> A. DC.	Peterevy moroti			
254	Boraginaceae	<i>Cordia trichotoma</i> (Vell.) Arráb. ex Steud.	Peterevy hu	EN		LC
255	Boraginaceae	<i>Heliotropium</i> sp.				
256	Boraginaceae	<i>Varronia</i> sp.				
257	Burseraceae	<i>Protium heptaphyllum</i> (Aubl.) Marchand	Yvyra ysy			LC
258	Cactaceae	<i>Cereus stenogonus</i> K. Schum.	Tuna		II	LC
259	Cactaceae	<i>Discocactus hartmanii</i> (K. Schum.) Britton & Rose		EN	I	CR
260	Cactaceae	<i>Monvillea cavendishii</i> (Monv.) Britton & Rose	Cola de León		II	
261	Cactaceae	<i>Opuntia elata</i> Link & Otto ex Salm- Dyck var. <i>cardiosperma</i> (K. Schum) R. Kiesling	Tuna de perro		II	LC
262	Cactaceae	<i>Rhipsalis</i> sp.	Suelta con suelta		II	
263	Campanulaceae	<i>Lobelia</i> aff. <i>nummularioides</i> Cham.				
264	Cannabaceae	<i>Celtis iguanaea</i> (Jacq.) Sarg.	Juasy'y			LC
265	Cannabaceae	<i>Celtis</i> sp.1	Juasy'y			
266	Cannabaceae	<i>Celtis</i> sp.2	Juasy'y			
267	Cannabaceae	<i>Trema micrantha</i> (L.) Blume	Kurundi'y			
268	Celastraceae	<i>Hippocratea volubilis</i> L.				
269	Celastraceae	<i>Monteverdia ilicifolia</i> (Mart. ex Reissek) Biral	Cangorosa	EN		
270	Celastraceae	<i>Plenckia populnea</i> Reissek				
271	Celastraceae	<i>Salacia elliptica</i> (Mart. ex Schult.) G. Don	Pakuri brasileiro			LC
272	Celastraceae	<i>Semialarium paniculatum</i> (Mart. ex Schult.) N. Hallé				
273	Celastraceae	<i>Tontelea micrantha</i> (Mart. ex Schult.) A.C. Sm.				
274	Clusiaceae	<i>Garcinia brasiliensis</i> Mart.	Pakuri			
275	Combretaceae	<i>Combretum leprosum</i> Mart.	Carne de vaca			LC
276	Combretaceae	<i>Combretum</i> sp.				
277	Combretaceae	<i>Terminalia argentea</i> Mart.	Capitán			LC
278	Combretaceae	<i>Terminalia triflora</i> (Griseb.) Lillo	Guajayvi sa'yju			LC
279	Convolvulaceae	<i>Bonamia</i> aff. <i>subssilis</i> Hassl.				
280	Convolvulaceae	<i>Cuscuta</i> sp.	Cabello de ángel			
281	Convolvulaceae	<i>Evolvulus sericeus</i> Sw.				
282	Convolvulaceae	<i>Evolvulus</i> sp.				
283	Convolvulaceae	<i>Ipomoea</i> aff. <i>aemilii</i> (O'Donnell) J.R. I. Wood & R. Degen ENDEMIC				
284	Convolvulaceae	<i>Ipomoea malveoides</i> Meisn.				

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285	Convolvulaceae	<i>Ipomoea</i> sp.1				
286	Convolvulaceae	<i>Ipomoea</i> sp.2				
287	Dilleniaceae	<i>Curatella americana</i> L.				
288	Ebenaceae	<i>Diospyros lasiocalyx</i> (Mart.) B. Walln.				
289	Erythroxylaceae	<i>Erythroxylum cuneifolium</i> (Mart.) O.E. Schulz	Coca del Campo			
290	Erythroxylaceae	<i>Erythroxylum suberosum</i> A. St.-Hil.				LC
291	Euphorbiaceae	<i>Acalypha</i> sp.1				
292	Euphorbiaceae	<i>Acalypha</i> sp.2				
293	Euphorbiaceae	<i>Acalypha</i> sp.3				
294	Euphorbiaceae	<i>Actinostemon conceptionis</i> (Chodat & Hassl.) Hochr.				
295	Euphorbiaceae	<i>Adelia membranifolia</i> (Müll. Arg.) Chodat & Hassl.				
296	Euphorbiaceae	<i>Caperonia</i> aff. <i>castaneifolia</i> (L.) A. St.-Hil.				
297	Euphorbiaceae	<i>Caperonia</i> aff. <i>palustris</i> (L.) A.St.-Hill.				
298	Euphorbiaceae	<i>Cnidocolus albomaculatus</i> (Pax) I.M. Johnst.	Ortiga			
299	Euphorbiaceae	<i>Croton andinus</i> Müll. Arg.				
300	Euphorbiaceae	<i>Croton campestris</i> A. St.- Hil. (dorado)				
301	Euphorbiaceae	<i>Croton glandulosus</i> L.				
302	Euphorbiaceae	<i>Croton urucurana</i> Baill.	Sangre de Drago, Uruku Râ, Pyuchu			
303	Euphorbiaceae	<i>Croton</i> sp.1				
304	Euphorbiaceae	<i>Croton</i> sp.2				
305	Euphorbiaceae	<i>Croton</i> sp.3				
306	Euphorbiaceae	<i>Croton</i> sp.4				
307	Euphorbiaceae	<i>Croton</i> sp.5				
308	Euphorbiaceae	<i>Croton</i> sp.6				
309	Euphorbiaceae	<i>Croton</i> sp.7				
310	Euphorbiaceae	<i>Dalechampia scandens</i> L.				
311	Euphorbiaceae	<i>Dalechampia</i> sp.				
312	Euphorbiaceae	<i>Gymnanthes discolor</i> (Spreng.) Müll. Arg.				
313	Euphorbiaceae	<i>Manihot</i> aff. <i>anisophylla</i> Müll. Arg.				
314	Euphorbiaceae	<i>Manihot</i> sp.1				
315	Euphorbiaceae	<i>Manihot</i> sp.2				
316	Euphorbiaceae	<i>Microstachys hispida</i> (Mart.) Govaerts				
317	Euphorbiaceae	<i>Philyra brasiliensis</i> Klotzsch				
318	Euphorbiaceae	<i>Sapium haematospermum</i> Müll. Arg.	Kurupika'y			LC
319	Euphorbiaceae	<i>Sebastiania</i> sp.1				
320	Euphorbiaceae	<i>Sebastiania</i> sp.2				
321	Euphorbiaceae	<i>Sebastiania</i> sp.3				
322	Euphorbiaceae	<i>Stillingia</i> aff. <i>salpingadenia</i> (Muell. Arg.) Huber				
323	Euphorbiaceae	Morfoespecie 1				
324	Euphorbiaceae	Morfoespecie 2				
325	Fabaceae	<i>Acosmium subelegans</i> (Mohlenbr.) Yakovlev				
326	Fabaceae	<i>Adesmia</i> sp.				
327	Fabaceae	<i>Aeschynomene</i> aff. <i>americana</i> L.				
328	Fabaceae	<i>Aeschynomene elegans</i> Schltld. & Cham.				
329	Fabaceae	<i>Aeschynomene histrix</i> Poir.				
330	Fabaceae	<i>Aeschynomene</i> sp.1				
331	Fabaceae	<i>Aeschynomene</i> sp.2				
332	Fabaceae	<i>Albizia niopoides</i> (Spruce ex Benth.) Burkart	Yvyra ju			LC
333	Fabaceae	<i>Amburana cearensis</i> (Allemão) A.C. Sm.	Trébol	EN		EN
334	Fabaceae	<i>Anadenanthera colubrina</i> (Vell.) Brenan var. <i>cebil</i> (Griseb.) Altschul	Kurupáy kuru			LC
335	Fabaceae	<i>Anadenanthera peregrina</i> (L.) Speg.	morosyvo			
336	Fabaceae	<i>Andira humilis</i> Mart. ex Benth.				
337	Fabaceae	<i>Arachis diogoi</i> Hoehne				NT

N°	Taxa	Especie	Common Names *	MAD ES	CITES	IUCN
338	Fabaceae	<i>Arachis hassleri</i> Krapov., Valls & C.E. Simpson ENDEMISMO				
339	Fabaceae	<i>Arachis nitida</i> Valls, Krapov. & C.E. Simpson				
340	Fabaceae	<i>Arachis paraguariensis</i> Chodat & Hassl. ssp. <i>paraguariensis</i>				NT
341	Fabaceae	<i>Arachis pflugeae</i> C.E. Simpson, Krapov. & Valls				
342	Fabaceae	<i>Arachis</i> sp.1				
343	Fabaceae	<i>Arachis</i> sp.2				
344	Fabaceae	<i>Bauhinia cheilantha</i> (Bong.) Steud.				LC
345	Fabaceae	<i>Bauhinia forficata</i> Link ssp. <i>pruinosa</i> (Vogel) Fortunato & Wunderlin	Pata de buey			
346	Fabaceae	<i>Bauhinia hagenbeckii</i> Harms				
347	Fabaceae	<i>Bauhinia</i> cfr. <i>mollis</i> (Bong.) D. Dietr.				
348	Fabaceae	<i>Bauhinia</i> sp.1				
349	Fabaceae	<i>Bauhinia</i> sp.2				
350	Fabaceae	<i>Bauhinia</i> sp.3				
351	Fabaceae	<i>Calliandra brevicaulis</i> Micheli var. <i>brevicaulis</i>				
352	Fabaceae	<i>Calliandra parviflora</i> Hook. & Arn.	Niño azote			
353	Fabaceae	<i>Camptosema</i> sp.				
354	Fabaceae	<i>Cenostigma marginatum</i> (Tul.) E. Gagnon & G.P. Lewis				
355	Fabaceae	<i>Chamaecrista flexuosa</i> (L.) Green				
356	Fabaceae	<i>Chamaecrista rotundifolia</i> (Pers.) Greene				
357	Fabaceae	<i>Chamaecrista serpens</i> (L.) Greene				
358	Fabaceae	<i>Chamaecrista</i> aff. <i>nictitans</i> (L.) Moench				
359	Fabaceae	<i>Chloroleucon tenuiflorum</i> (Benth.) Barneby & J.W. Grimes	tatare			
360	Fabaceae	<i>Copaifera langsdorffii</i> Desf.	Kupa'y			LC
361	Fabaceae	<i>Crotalaria maypurensis</i> Kunth				
362	Fabaceae	<i>Crotalaria</i> sp.1				
363	Fabaceae	<i>Cyclolobium brasiliense</i> Benth.				LC
364	Fabaceae	<i>Desmanthus</i> sp.				
365	Fabaceae	<i>Desmodium barbatum</i> (L.) Benth.	taha taha			LC
366	Fabaceae	<i>Desmodium</i> sp.1				
367	Fabaceae	<i>Desmodium</i> sp.2	Taha taha			
368	Fabaceae	<i>Desmodium</i> sp.3	Taha taha			
369	Fabaceae	<i>Dimorphandra mollis</i> Benth.	Lorito pysa	EN		LC
370	Fabaceae	<i>Dipteryx alata</i> Vogel				
371	Fabaceae	<i>Enterolobium contortisiliquum</i> (Vell.) Morong	Timbo			LC
372	Fabaceae	<i>Enterolobium timbouva</i> Mart.	Timbo			LC
373	Fabaceae	<i>Eriosema</i> sp.				
374	Fabaceae	<i>Guibourtia hymenaeifolia</i> (Moric.) J. Léonard	Kuruñai			
375	Fabaceae	<i>Holocalyx balansae</i> Micheli	Yvyra pepe			LC
376	Fabaceae	<i>Hymenaea martiana</i> Hayne	Jatayba			
377	Fabaceae	<i>Hymenaea</i> sp.1				
378	Fabaceae	<i>Indigofera suffruticosa</i> Mill.				
379	Fabaceae	<i>Indigofera</i> sp.				
380	Fabaceae	<i>Inga affinis</i> DC.	Inga			
381	Fabaceae	<i>Inga uraguensis</i> Hook. & Arn.	Inga guasu			
382	Fabaceae	<i>Inga</i> sp.				
383	Fabaceae	<i>Lonchocarpus pluvialis</i> Rusby				
384	Fabaceae	<i>Machaerium aculeatum</i> Raddi	yvyra tanimbu			
385	Fabaceae	<i>Machaerium acutifolium</i> Vogel				LC
386	Fabaceae	<i>Machaerium hirtum</i> (Vell.) Stellfeld				
387	Fabaceae	<i>Macropitium</i> sp.				
388	Fabaceae	<i>Mimosa debilis</i> Humb. & Bonpl. ex Willd.	jukeri			
389	Fabaceae	<i>Mimosa dolens</i> Vell. (glauca)				
390	Fabaceae	<i>Mimosa glutinosa</i> Chodat & Hassl.				

N°	Taxa	Especie	Common Names *	MAD ES	CITES	IUCN
391	Fabaceae	<i>Mimosa pudica</i> L.				
392	Fabaceae	<i>Mimosa subsericea</i> Benth.				
393	Fabaceae	<i>Mimosa xanthocentra</i> Mart. var. <i>xanthocentra</i>				
394	Fabaceae	<i>Mimosa</i> sp.1				
395	Fabaceae	<i>Mimosa</i> sp.2				
396	Fabaceae	<i>Mimosa</i> sp.3				
397	Fabaceae	<i>Mimosa</i> sp.4				
398	Fabaceae	<i>Myrocarpus frondosus</i> Allemão ®	Incienso	EN		DD
399	Fabaceae	<i>Myroxylon peruiferum</i> L. f.	inciense colorado	EN		LC
400	Fabaceae	<i>Parapiptadenia rigida</i> (Benth.) Brenan	Kurupa'y ra			LC
401	Fabaceae	<i>Parkinsonia praecox</i> (Ruiz & Pav. ex Hook.) Hawkins	verde olivo			LC
402	Fabaceae	<i>Peltophorum dubium</i> (Spreng.) Taub.	Yvyra pyta			LC
403	Fabaceae	<i>Plathymenia reticulata</i> Benth.	morosyvo sa'yju			
404	Fabaceae	<i>Platypodium elegans</i> Vogel				LC
405	Fabaceae	<i>Pterogyne nitens</i> Tul.	Yvyraro			NT
406	Fabaceae	<i>Rhynchosia</i> sp.				
407	Fabaceae	<i>Riedeliella graciliflora</i> Harms				
408	Fabaceae	<i>Samanea tubulosa</i> (Benth.) Barneby & J.W. Grimes	Manduvi ra			LC
409	Fabaceae	<i>Senna paradictyon</i> (Vogel) H.S. Irwin & Barneby				
410	Fabaceae	<i>Sesbania exasperata</i> Kunth				
411	Fabaceae	<i>Stryphnodendron rotundifolium</i> Mart.	Barbatimao			
412	Fabaceae	<i>Stylosanthes guianensis</i> (Aubl.) Sw. var. <i>gracilis</i> (Kunth) Vogel				
413	Fabaceae	<i>Stylosanthes</i> sp.1				
414	Fabaceae	<i>Stylosanthes</i> sp.2 (Campo cerrado)				
415	Fabaceae	<i>Sweetia fruticosa</i> Spreng.	taperyva guasu			LC
416	Fabaceae	<i>Tachigali aurea</i> Tul.				
417	Fabaceae	<i>Tephrosia</i> sp.				
418	Fabaceae	<i>Zornia</i> sp.1				
419	Fabaceae	<i>Zornia</i> sp.2				
420	Fabaceae	<i>Zornia</i> sp.3				
421	Fabaceae	<i>Zornia</i> sp.4				
422	Fabaceae	Morfoespecie 1				
423	Gentianaceae	<i>Schultesia</i> sp.				
424	Gesneriaceae	<i>Sinningia allagophylla</i> (Mart.) Wiehler	Ynambu jety			
425	Hydroleaceae	<i>Hydrolea elatior</i> Schott				
426	Hydroleaceae	<i>Hydrolea</i> aff. <i>spinosa</i> L. var. <i>paraguayensis</i> (Chodat) Davenp.				
427	Lamiaceae	<i>Aegiphilla verticillata</i> Vell.				
428	Lamiaceae	<i>Cantinoa althaeifolia</i> (Pohl ex Benth.) Harley & J.F.B. Pastore				
429	Lamiaceae	<i>Cantinoa mutabilis</i> (Rich.) Harley & J.F.B. Pastore				
430	Lamiaceae	<i>Hyptis</i> sp.1				
431	Lamiaceae	<i>Hyptis</i> sp.2				
432	Lamiaceae	<i>Hyptis</i> sp.3				
433	Lamiaceae	<i>Hyptis</i> sp.4 (Pubescente)				
434	Lamiaceae	<i>Hyptis</i> sp.5 (Normal) (Campo sucio)				
435	Lamiaceae	<i>Ocimum ovatum</i> Benth.				
436	Lamiaceae	<i>Vitex cymosa</i> Bertero ex Spreng.	Taruma			LC
437	Lauraceae	<i>Nectandra</i> aff. <i>cissiflora</i> Nees	laurel ne			
438	Lauraceae	<i>Nectandra megaphylla</i> Hassl. (ENDEMISMO)				
439	Lauraceae	<i>Ocotea diospyrifolia</i> (Meisn.) Mez	Laurel sa'yju			LC
440	Lauraceae	<i>Ocotea minarum</i> (Nees & Mart. ex Nees) Mez				
441	Lentibulariaceae	<i>Utricularia</i> sp.1				
442	Lentibulariaceae	<i>Utricularia</i> sp.2 (Sabana Inundada)				
443	Lythraceae	<i>Cuphea lysimachioides</i> Cham. et Schltdl.	Ysypo pere			

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444	Lythraceae	<i>Cuphea</i> sp.1				
445	Lythraceae	<i>Cuphea</i> sp.2				
446	Lythraceae	<i>Lafoensia vandelliana</i> Cham. & Schltld.				
447	Lythraceae	<i>Pleurophora saccocarpa</i> Koehne				
448	Malpighiaceae	<i>Byrsonima</i> sp.				
449	Malpighiaceae	<i>Heteropterys glabra</i> Hook. & Arn.				
450	Malpighiaceae	<i>Janusia guaranitica</i> (A. St.-Hil.) A. Juss.				
451	Malpighiaceae	<i>Janusia mediterranea</i> (Vell.) W.R. Anderson				
452	Malpighiaceae	Morfoespecie 1				
453	Malvaceae	<i>Ayenia tomentosa</i> L.				
454	Malvaceae	<i>Ayenia</i> sp.				
455	Malvaceae	<i>Bytneria</i> sp.				
456	Malvaceae	<i>Ceiba</i> sp.	samu'u			
457	Malvaceae	<i>Corchorus argutus</i> Kunth				
458	Malvaceae	<i>Guazuma ulmifolia</i> Lam.	Kamba aka			LC
459	Malvaceae	<i>Helicteres gardneriana</i> A. St.-Hil. & Naudin				
460	Malvaceae	<i>Helicteres lhotzkyana</i> (Schott & Endl.) K. Schum.				
461	Malvaceae	<i>Hibiscus sororius</i> L.f.				
462	Malvaceae	<i>Hibiscus</i> sp. (Flores naranja)				
463	Malvaceae	<i>Luehea divaricata</i> Mart.	Ka'a oveti			DD
464	Malvaceae	<i>Luehea</i> aff. <i>grandiflora</i> Mart.				
465	Malvaceae	<i>Malvastrum coromandelianum</i> (L.) Garcke				
466	Malvaceae	<i>Melochia</i> aff. <i>pilosa</i> (Mill.) Fawc. & Rendle				
467	Malvaceae	<i>Melochia parvifolia</i> Kunth				
468	Malvaceae	<i>Melochia simplex</i> A. St.-Hil.				
469	Malvaceae	<i>Melochia villosa</i> (Mill.) Fawc. & Rendle				
470	Malvaceae	<i>Melochia</i> sp.				
471	Malvaceae	<i>Pavonia</i> sp.				
472	Malvaceae	<i>Peltaea</i> sp.				
473	Malvaceae	<i>Pseudobombax tomentosum</i> (Mart. & Zucc.) A. Robyns	Mandyju ra			LC
474	Malvaceae	<i>Sida cordifolia</i> L.	Malva blanca			
475	Malvaceae	<i>Sida linifolia</i> Cav.				
476	Malvaceae	<i>Sida</i> sp.1 (Campo cerrado) (Campo sucio)				
477	Malvaceae	<i>Sida</i> sp.2 (Sabana alta-Pastura)				
478	Malvaceae	<i>Sida</i> sp.3 (Flores rosadas)				
479	Malvaceae	<i>Sida</i> sp.4 (grande, fl. Naranja)				
480	Malvaceae	<i>Sidastrum paniculatum</i> (L.) Fryxell	Makagua ka'á			
481	Malvaceae	<i>Sterculia striata</i> A. St.-Hil. & Naudin				LC
482	Malvaceae	<i>Triumfetta semitriloba</i> Jacq.	Amoreseco			
483	Malvaceae	<i>Waltheria</i> sp.				
484	Malvaceae	Morfoespecie 1				
485	Malvaceae	Morfoespecie 2				
486	Malvaceae	Morfoespecie 3				
487	Melastomataceae	<i>Acisanthera alsinaefolia</i> Tr.				
488	Melastomataceae	<i>Acisanthera</i> sp.				
489	Melastomataceae	<i>Miconia</i> sp.				
490	Melastomataceae	<i>Tibouchina</i> sp.1	flor de cuaresma			
491	Melastomataceae	<i>Tibouchina</i> sp. 2				
492	Melastomataceae	Morfoespecie 1 (Campo sucio)				
493	Melastomataceae	Morfoespecie 2 (Sabana inundable)				
494	Meliaceae	<i>Guarea guidonia</i> (L.) Sleumer	Cedro blanco			LC

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495	Meliaceae	<i>Guarea macrophylla</i> Vahl ssp. <i>spiciflora</i> (A. Juss.) T.D. Penn.	Cedrillo			LC
496	Meliaceae	<i>Trichilia catigua</i> A. Juss.	katigua pytá			
497	Meliaceae	<i>Trichilia clausenii</i> C. DC.	Katigua guasu			
498	Meliaceae	<i>Trichilia elegans</i> A. Juss.	Katigua'i			LC
499	Meliaceae	<i>Trichilia pallens</i> C. DC.	Katigua moroti			NT
500	Meliaceae	<i>Trichilia pallida</i> Sw.	Katigua moroti			
501	Meliaceae	<i>Trichilia stellato-tomentosa</i> Kuntze		EN		LC
502	Menispermaceae	<i>Cissampelos</i> sp.				
503	Menispermaceae	<i>Odontocarya tamoides</i> (DC.) Miers var. <i>canescens</i> (Miers) Barneby				
504	Menyanthaceae	<i>Nymphoides indica</i> (L.) Kuntze				
505	Menyanthaceae	<i>Nymphoides verrucosa</i> (R.E. Fr.) A. Galan & G. Navarro				
506	Moraceae	<i>Brosimum gaudichaudii</i> Trécul				
507	Moraceae	<i>Dorstenia brasiliensis</i> Lam.	Tarope			
508	Moraceae	<i>Dorstenia cayapia</i> Vell. ssp. <i>paraguariensis</i> (Hassl.) C.C. Berg				
509	Moraceae	<i>Ficus</i> sp.1				
510	Moraceae	<i>Ficus</i> sp.2	guapo'y			
511	Moraceae	<i>Ficus</i> sp.3	guapo'y			
512	Moraceae	<i>Maclura tinctoria</i> (L.) Steud. ssp. <i>tinctoria</i>	Tata jyva			LC
513	Moraceae	<i>Sorocea sprucei</i> (Baill.) J.F. Macbr. ssp. <i>saxicola</i> (Hassl.) C.C. Berg	María molle			LC
514	Myrtaceae	<i>Campomanesia adamantium</i> (Cambess.) O. Berg	Guavira mi			
515	Myrtaceae	<i>Campomanesia sessiliflora</i> (O. Berg) Mattos				
516	Myrtaceae	<i>Campomanesia xanthocarpa</i> O. Berg	guavira pyta			
517	Myrtaceae	<i>Eugenia moraviana</i> O. Berg				
518	Myrtaceae	<i>Eugenia uniflora</i> L.	Ñangapiry			
519	Myrtaceae	<i>Myrcianthes pungens</i> (O. Berg) D. Legrand	Guaviju			
520	Myrtaceae	<i>Myrciaria cuspidata</i> O. Berg	Typycha ka'aguy			
521	Myrtaceae	<i>Psidium grandifolium</i> DC.	Katuava	EN		
522	Myrtaceae	<i>Psidium guajava</i> L.	Arasa			
523	Myrtaceae	<i>Psidium</i> sp.1	Arasa			
524	Myrtaceae	<i>Psidium</i> sp.2	Arasa			
525	Myrtaceae	<i>Psidium</i> sp.3	Arasa			
526	Myrtaceae	<i>Psidium</i> sp.4 (Campo sucio)(Sabana alta)				
527	Myrtaceae	<i>Psidium</i> sp.5 (Campo cerrado)	arasa			
528	Myrtaceae	Morfoespecie 1				
529	Myrtaceae	Morfoespecie 2				
530	Myrtaceae	Morfoespecie 3				
531	Myrtaceae	Morfoespecie 4				
532	Myrtaceae	Morfoespecie 5				
533	Myrtaceae	Morfoespecie 6				
534	Nyctaginaceae	<i>Neea hermaphrodita</i> S. Moore				
535	Nyctaginaceae	<i>Neea pendulina</i> Heimerl				
536	Nyctaginaceae	<i>Pisonia aculeata</i> L.	Jagua pinda			LC
537	Nymphaeaceae	<i>Nymphaea prolifera</i> Wiersema	Ninfea			
538	Ochnaceae	<i>Sauvagesia erecta</i> L.				LC
539	Olacaceae	<i>Ximения intermedia</i> (Chodat & Hassl.) De Filippis				
540	Oleaceae	<i>Menodora integrifolia</i> (Cham. & Schldl.) Steud.				
541	Oleaceae	<i>Priogymnanthus hasslerianus</i> (Chodat) P.S. Green	ka'a vera			
542	Onagraceae	<i>Ludwigia filiformis</i> (Micheli) Ramamoorthy				
543	Onagraceae	<i>Ludwigia hassleriana</i> (Chodat) Ramamoorthy				
544	Onagraceae	<i>Ludwigia nervosa</i> (Poir.) H. Hara	Mandì'o Kâu			
545	Onagraceae	<i>Ludwigia sericea</i> (Cambess.) H.Hara				

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546	Onagraceae	<i>Ludwigia</i> sp.				
547	Opiliaceae	<i>Agonandra brasiliensis</i> Miers ex Benth. & Hook. f.				LC
548	Orobanchaceae	<i>Agalinis</i> aff. <i>linarioides</i> (Cham. & Schltld.) D'Arcy				
549	Orobanchaceae	<i>Buchnera</i> aff. <i>longifolia</i> Kunth				
550	Oxalidaceae	<i>Oxalis sellowii</i> Spreng. var. <i>rosea</i> (Chodat) Lourteig				
551	Oxalidaceae	<i>Oxalis renifolia</i> R. Knuth				
552	Passifloraceae	<i>Passiflora cincinnata</i> Mast.	Mburukuja			
553	Passifloraceae	<i>Passiflora tricuspidata</i> Mast.				
554	Passifloraceae	<i>Passiflora</i> sp.1				
555	Passifloraceae	<i>Passiflora</i> sp.2				
556	Phyllanthaceae	<i>Phyllanthus chacoensis</i> Morong	Jakare pito			
557	Phyllanthaceae	<i>Phyllanthus niruri</i> L.	Para para'i			
558	Phyllanthaceae	<i>Phyllanthus</i> sp.				
559	Picramniaceae	<i>Picramnia sellowii</i> Planch.				
560	Piperaceae	<i>Peperomia</i> aff. <i>aceroana</i> C. DC.				
561	Piperaceae	<i>Piper</i> sp.1				
562	Piperaceae	<i>Piper</i> sp.2				
563	Piperaceae	<i>Piper</i> sp.3				
564	Piperaceae	<i>Piper</i> sp.4				
565	Plantaginaceae	<i>Angelonia integerrima</i> Spreng.				
566	Plantaginaceae	<i>Angelonia salicarifolia</i> Bonpl.				
567	Plantaginaceae	<i>Bacopa</i> aff. <i>salzmannii</i> (Benth.) Wettst. ex Edwall				
568	Plantaginaceae	<i>Scoparia dulcis</i> L.	Typycha kuratu			
569	Plantaginaceae	<i>Scoparia montevidensis</i> (Spreng.) R. E. Fr.				
570	Plantaginaceae	<i>Stemodia</i> sp.				
571	Plantaginaceae	Morfoespecie 1 (Sabana Inundable ST)				
572	Plantaginaceae	Morfoespecie 2 (Campo sucio)				
573	Polygalaceae	<i>Acanthocladus albicans</i> A.W. Benn.				
574	Polygalaceae	<i>Bredemeyera floribunda</i> Willd.				
575	Polygalaceae	<i>Polygala linoides</i> Poir. var. <i>linoides</i>				
576	Polygalaceae	<i>Polygala molliginifolia</i> A.St.-Hil. & Moq.				
577	Polygonaceae	<i>Coccoloba</i> sp.				
578	Polygonaceae	<i>Polygonum</i> sp.1				
579	Polygonaceae	<i>Polygonum</i> sp.2				
580	Polygonaceae	<i>Polygonum</i> sp.3				
581	Portulacaceae	<i>Portulaca</i> sp.	Verdolaga			
582	Primulaceae	<i>Clavija nutans</i> (Vell.) B. Ståhl	jagua ku, tumby rasy pohä			
583	Primulaceae	<i>Myrsine</i> sp.1	Kanelón			
584	Primulaceae	<i>Myrsine</i> sp.2				
585	Rhamnaceae	<i>Gouania</i> sp.				
586	Rhamnaceae	<i>Rhamnidium elaeocarpum</i> Reissek	Taruma'i			
587	Rubiaceae	<i>Borreria poaya</i> A. St.-Hil.) DC.				
588	Rubiaceae	<i>Borreria</i> sp.1				
589	Rubiaceae	<i>Borreria</i> sp.2				
590	Rubiaceae	<i>Calycophyllum multiflorum</i> Griseb.	Palo blanco			
591	Rubiaceae	<i>Chomelia obtusa</i> Cham. & Schltld.				
592	Rubiaceae	<i>Cordia sessilis</i> (Vell.) Kuntze	Asuka revira			
593	Rubiaceae	<i>Coussarea platyphylla</i> Müll. Arg.				
594	Rubiaceae	<i>Genipa americana</i> L.	Ñandypa guasu			
595	Rubiaceae	<i>Geophila repens</i> (L.) I.M. Johnst.				
596	Rubiaceae	<i>Guettarda viburnoides</i> Cham. & Schltld.	angélica			
597	Rubiaceae	<i>Machaonia brasiliensis</i> (Hoffmanns. ex Humb.) Cham. & Schltld.				LC
598	Rubiaceae	<i>Mitracarpus</i> sp.				
599	Rubiaceae	<i>Palicourea crocea</i> (Sw.) Roem. & Schult.				

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600	Rubiaceae	<i>Psychotria carthagenensis</i> Jacq.	cafecito; maría molle			
601	Rubiaceae	<i>Psychotria leiocarpa</i> Cham. & Schltld.				
602	Rubiaceae	<i>Randia</i> aff. <i>brevituba</i> Judkevich & R.M. Salas	Ñuati kurusu			
603	Rubiaceae	<i>Randia calycina</i> Cham.	Ñuati kurusu			
604	Rubiaceae	<i>Spermacoce verticillata</i> L.	typycha corredor			
605	Rubiaceae	<i>Spermacoce</i> sp.				
606	Rubiaceae	<i>Staelia</i> sp.1				
607	Rubiaceae	<i>Staelia</i> sp. 2 (Campo sucio) (Sabana alta)				
608	Rubiaceae	<i>Tocoyena formosa</i> (Cham. & Schltld.) K. Schum.				
609	Rubiaceae	Morfoespecie 1 (Isleta)				
610	Rubiaceae	Morfoespecie 2 (Sabana inundable)				
611	Rutaceae	<i>Balfourodendron riedelianum</i> (Engl.) Engl.	Guatambu	EN		EN
612	Rutaceae	<i>Citrus aurantium</i> L.	Apepu, Naranja Hai			
613	Rutaceae	<i>Helietta apiculata</i> Benth.	Yvyra ovi			
614	Rutaceae	<i>Zanthoxylum caribaeum</i> Lam. ssp. <i>rugosum</i> (A. St.-Hil. & Tul.) Reynel	Tembetary hu			LC
615	Rutaceae	<i>Zanthoxylum fagara</i> (L.) Sarg. ssp. <i>fagara</i>	Tembetary mi, Uña de gato			
616	Rutaceae	<i>Zanthoxylum petiolare</i> A. St.-Hil. & Tul.	Tembetary moroti			
617	Rutaceae	<i>Zanthoxylum riedelianum</i> Engl.	tembetary sa'yju			LC
618	Rutaceae	<i>Zanthoxylum rigidum</i> Humb. & Bonpl. ex Willd. ssp. <i>hasslerianum</i> (Chodat) Reynel	Tembetary, pichona titi			
619	Salicaceae	<i>Casearia aculeata</i> Jacq.				LC
620	Salicaceae	<i>Casearia gossypiosperma</i> Briq.	Mbavy guasu			
621	Salicaceae	<i>Casearia sylvestris</i> Sw.	Burro ka'a			LC
622	Salicaceae	<i>Casearia</i> sp.1				
623	Salicaceae	<i>Casearia</i> sp.2				
624	Salicaceae	<i>Prockia crucis</i> P. Browne ex L.				
625	Salicaceae	<i>Xylosma venosa</i> N.E. Br.	Ñuati pyta			LC
626	Sapindaceae	<i>Allophylus edulis</i> (A. St.-Hil., A. Juss. & Cambess.) Hieron. ex Niederl.	Koku			LC
627	Sapindaceae	<i>Allophylus pauciflorus</i> Radlk.	Koku			
628	Sapindaceae	<i>Averrhoidium paraguayense</i> Radlk.				
629	Sapindaceae	<i>Cardiospermum grandiflorum</i> Sw.	ysypo kamambu, kamambu guasu			
630	Sapindaceae	<i>Cupania vernalis</i> Cambess.	Jagua rata'y pyta			LC
631	Sapindaceae	<i>Dilodendron bipinnatum</i> Radlk.	Yvyra ruru			
632	Sapindaceae	<i>Magonia pubescens</i> A. St.-Hil.	Yvyra hy'a			LC
633	Sapindaceae	<i>Paullinia elegans</i> Cambess.				
634	Sapindaceae	<i>Paullinia pinnata</i> L.	Kururu ape			
635	Sapindaceae	<i>Serjania erecta</i> Radlk.				
636	Sapindaceae	<i>Serjania</i> sp.				
637	Sapindaceae	<i>Talisia angustifolia</i> Radlk.	Yvyra'i ka'i			
638	Sapindaceae	<i>Talisia esculenta</i> (Cambess.) Radlk.	Karaja bola			
639	Sapotaceae	<i>Chrysophyllum gonocarpum</i> (Mart. & Eichler) Engl.	Aguai			LC
640	Sapotaceae	<i>Chrysophyllum marginatum</i> (Hook. & Arn.) Radlk.	Pykasu rembi'u			LC
641	Sapotaceae	<i>Pouteria</i> sp.				
642	Sapotaceae	<i>Sideroxylon obtusifolium</i> (Roem. & Schult.) T.D. Penn.	guajayvi rai			LC
643	Solanaceae	<i>Capsicum</i> sp.				
644	Solanaceae	<i>Cestrum</i> sp.1				
645	Solanaceae	<i>Cestrum</i> sp.2 (Campo cerrado)				
646	Solanaceae	<i>Solanum granulosum-leprosum</i> Dunal	hu'i moneha			
647	Solanaceae	<i>Solanum palinacanthum</i> Dunal	Tuti'a			
648	Solanaceae	<i>Solanum paniculatum</i> L.	Juruvéva			LC

N°	Taxa	Especie	Common Names *	MAD ES	CITES	IUCN
649	Solanaceae	<i>Solanum viarum</i> Dunal	mbói rembi'u			LC
650	Solanaceae	<i>Solanum</i> sp.				
651	Styracaceae	<i>Styrax</i> sp.				
652	Trigoniaceae	<i>Trigonia boliviana</i> Warm.				
653	Turneraceae	<i>Turnera grandiflora</i> (Urb.) Arbo	Popam yaamit (Lengua- Maskoy)			
654	Turneraceae	<i>Turnera</i> sp.1				
655	Turneraceae	<i>Turnera</i> sp.2				
656	Urticaceae	<i>Cecropia pachystachya</i> Trécul	Amba'y			
657	Verbenaceae	<i>Glandularia aristigera</i> (S. Moore) Tronc.				
658	Verbenaceae	<i>Glandularia</i> sp.				
659	Verbenaceae	<i>Lippia lupulina</i> Cham.				
660	Verbenaceae	<i>Lippia</i> aff. <i>turnerifolia</i> Cham. var. <i>turnerifolia</i>				
661	Verbenaceae	<i>Stachytarpheta cayennensis</i> (Rich.) Vahl	tatu rugu'ai			
662	Verbenaceae	Morfoespecie 1				
663	Verbenaceae	Morfoespecie 2				
664	Vitaceae	<i>Cissus erosa</i> Rich.	parral saite			
665	Vitaceae	<i>Cissus verticillata</i> (L.) Nicolson & C.E. Jarvis	ka'avurä			
666	Vochysiaceae	<i>Qualea grandiflora</i> C. Mart.				LC

References:

MADES (National) EN (Endangered) species categorized by the IUCN as "EN, CR, DD"; AE (Threatened with Extinction): species categorized as "VU" by the IUCN.

CITES: Appendix I: species with the highest degree of danger among species of fauna and flora, in danger of extinction. CITES prohibits international trade in specimens of these species, except when the import is for non-commercial purposes, i.e. for scientific research. Appendix II: species that are not necessarily threatened with extinction but could become so unless their trade is strictly controlled.

*Not all common names were identified.

Table 8 – List of species with known uses

N°	Species and author	Common name in Spanish or Guaraní	Uses
1	<i>Monvillea cavendishii</i> (Monv.) Britton & Rose	Cola de León	Co
2	<i>Garcinia brasiliensis</i> Mart.	Pakuri	Co
3	<i>Erythroxylum cuneifolium</i> (Mart.) O.E. Schulz	Coca del Campo	Co
4	<i>Anacardium humile</i> A. St.-Hil.	kaju'i	Co, Fo, Or
5	<i>Pseudananas sagenarius</i> (Arruda) Camargo	yvira, Kuantu purâ	Co, In
6	<i>Cnidocolus albomaculatus</i> (Pax) I.M. Johnst.	Ortiga	Co, Me
7	<i>Campomanesia adamantium</i> (Cambess.) O. Berg	Guavira mi	Co, Me, Mel
8	<i>Sideroxylon obtusifolium</i> (Roem. & Schult.) T.D. Penn.	guajayvi rai	Com, Co
9	<i>Syagrus campylospatha</i> (Barb. Rodr.) Becc.	yatay mi	Fo
10	<i>Syagrus oleracea</i> (Mart.) Becc.	guaviroba	Fo
11	<i>Erythroxylum suberosum</i> A. St.-Hil.		Fo
12	<i>Ficus</i> sp.2	guapo'y	Fo
13	<i>Ficus</i> sp.3	guapo'y	Fo
14	<i>Annona nutans</i> (R.E. Fr.) R.E. Fr.	Aratiku ñu	Fo, Co
15	<i>Annona dioica</i> A. St.-Hil.	Aratiku ñu	Fo, Co, Me
16	<i>Annona emarginata</i> (Schltdl.) H. Rainer	Aratiku'i	Fo, Co, Or
17	<i>Andropogon bicornis</i> L.	Aguara Ruguai, Cola de Zorro	Fo, In, Co
18	<i>Didymopanax morototoni</i> (Aubl.) Decne. & Planch.	Amba'y guasu	Fo, Ind
19	<i>Sorocea sprucei</i> (Baill.) J.F. Macbr. ssp. <i>saxicola</i> (Hassl.) C.C. Berg	María molle	Fo, MC
20	<i>Nectandra</i> aff. <i>cissiflora</i> Nees	laurel ne	Fo, MC, Or
21	<i>Psidium</i> sp.2	Arasa	Fo, Me, Mel
22	<i>Syagrus romanzoffiana</i> (Cham.) Glassman	pindo	Fo, Mel, Me
23	<i>Chrysophyllum marginatum</i> (Hook. & Arn.) Radlk.	Pykasu rembi'u	Fo, Or, In
24	<i>Curatella americana</i> L.		Fo, Or, Me, Com, Mel
25	<i>Trichilia catigua</i> A. Juss.	katigua pytâ	Fo, Or, Mel
26	<i>Forsteronia glabrescens</i> Müll. Arg.	ysypo kamby	In, Mel, MC
27	<i>Pseudobombax tomentosum</i> (Mart. & Zucc.) A. Robyns	Mandyju ra	Ind
28	<i>Cordia glabrata</i> A. DC.	Peterevy moroti	Ind, MC, Or
29	<i>Enterolobium timbouwa</i> Mart.	Timbo	Ind, MC, Or, Fo
30	<i>Enterolobium contortisiliquum</i> (Vell.) Morong	Timbo	Ind, MC, Or, Fo, Mel
31	<i>Cordia trichotoma</i> (Vell.) Arráb. ex Steud.	Peterevy hu	Ind, MC, Or, Mel
32	<i>Trichilia pallens</i> C. DC.	Katigua moroti	Ind, Or
33	<i>Albizia niopoides</i> (Spruce ex Benth.) Burkart	Yvyra ju	Ind, Or, Mel
34	<i>Terminalia triflora</i> (Griseb.) Lillo	Guajayvi sa'yju	Ind., Or, MC, Mel
35	<i>Vitex cymosa</i> Bertero ex Spreng.	Taruma	MC, Co, Fo, Me, Or
36	<i>Dimorphandra mollis</i> Benth.	Lorito pysa	MC, Fo, Me, Co, Ind
37	<i>Trichilia clausenii</i> C. DC.	Katigua guasu	MC, Fo, Or
38	<i>Guazuma ulmifolia</i> Lam.	Kamba aka	MC, Ind, Com, Ind, Or, Fo, Mel
39	<i>Parapiptadenia rigida</i> (Benth.) Brenan	Kurupa'y ra	MC, Ind, Com, Mel, Or
40	<i>Ocotea minarum</i> (Nees & Mart. ex Nees) Mez		MC, Ind, Fo
41	<i>Trichilia pallida</i> Sw.	Katigua moroti	MC, Ind, Fo

N°	Species and author	Common name in Spanish or Guarani	Uses
42	<i>Ocotea diospyrifolia</i> (Meisn.) Mez	Laurel sa'yju	MC, Ind, Fo, Mel
43	<i>Sterculia striata</i> A. St.-Hil. & Naudin		MC, Ind, Fo, Or
44	<i>Myrocarpus frondosus</i> Allemão ®	Incienso	MC, Ind, Mel, Me, Or
45	<i>Holocalyx balansae</i> Micheli	Yvyra pepe	MC, Ind, Or, Fo
46	<i>Handroanthus impetiginosus</i> (Mart. ex DC.) Mattos	Lapacho rosado	MC, Ind, Or, Mel
47	<i>Cordia americana</i> (L.) Gottschling & J.S. Mill.	Guajayvi	MC, Ind, Or, Mel
48	<i>Pterogyne nitens</i> Tul.	Yvyraro	MC, Ind, Orn, Mel
49	<i>Copaifera langsdorffii</i> Desf.	Kupa'y	MC, Me, Or, Mel, Ind
50	<i>Astronium fraxinifolium</i> Schott var. <i>glabrum</i> Engl.	urunde'y para morotĩ	MC, Or
51	<i>Aspidosperma cylindrocarpon</i> Müll. Arg.	Palo rosa	MC, Or
52	<i>Aspidosperma pyriforme</i> C. Mart.	Palo rosa	MC, Or
53	<i>Tabebuia roseo-alba</i> (Ridl.) Sandwith	Lapacho blanco	MC, Or
54	<i>Cyclolobium brasiliense</i> Benth.		MC, Or
55	<i>Amburana cearensis</i> (Allemão) A.C. Sm.	Trébol	MC, Or, Ind
56	<i>Myracrodruon urundeuva</i> Allemão	Urunde'y mi	MC, Or, Mel
57	<i>Tachigali aurea</i> Tul.		MC, Or, Mel, Or, Me
58	<i>Lygodium venustum</i> Sw.		Me
59	<i>Hemionitis tomentosa</i> (Lam.) Raddi	Doradilla	Me
60	<i>Bromelia balansae</i> Mez	Karaguata	Me
61	<i>Scleria distans</i> Poir.	Kapi'í kaĩ estero	Me
62	<i>Andropogon lateralis</i> Nees	kapi'i pytä	Me
63	<i>Elionurus muticus</i> (Spreng.) Kuntze	Espartillo guasu	Me
64	<i>Schinus weinmannifolius</i> Engl.	Molle'i	Me
65	<i>Dasyphyllum brasiliense</i> (Spreng.) Cabrera var. <i>brasiliense</i>	Ñurĩ	Me
66	<i>Pluchea sagittalis</i> (Lam.) Cabrera	yerba de lucero	Me
67	<i>Porophyllum ruderale</i> (Jacq.) Cass.	yryvu retyma	Me
68	<i>Solidago chilensis</i> Meyen	Mbu'y sa'yju	Me
69	<i>Protium heptaphyllum</i> (Aubl.) Marchand	Yvyra ysy	Me
70	<i>Inga affinis</i> DC.	Inga	Me
71	<i>Sidastrum paniculatum</i> (L.) Fryxell	Makagua ka'á	Me
72	<i>Triumfetta semitriloba</i> Jacq.	Amoreseco	Me
73	<i>Dorstenia brasiliensis</i> Lam.	Tarope	Me
74	<i>Pisonia aculeata</i> L.	Jagua pinda	Me
75	<i>Clavija nutans</i> (Vell.) B. Ståhl	jagua ku, tumby rasy pohä	Me
76	<i>Helieta apiculata</i> Benth.	Yvyra ovi	Me
77	<i>Solanum granulosum-leprosum</i> Dunal	hu'i moneha	Me
78	<i>Solanum palinacanthum</i> Dunal	Tuti'a	Me
79	<i>Solanum paniculatum</i> L.	Juruvéva	Me
80	<i>Cecropia pachystachya</i> Trécul	Amba'y	Me
81	<i>Lippia lupulina</i> Cham.		Me
82	<i>Stachytarpheta cayennensis</i> (Rich.) Vahl	tatu rugu'ai	Me
83	<i>Cissus verticillata</i> (L.) Nicolson & C.E. Jarvis	ka'avurä	Me
84	<i>Aspidosperma quebracho-blanco</i> Schltldl.	quebracho blanco	Me
85	<i>Passiflora cincinnata</i> Mast.	Mburukuja	Me, Co
86	<i>Duguetia furfuracea</i> (A. St.-Hil.) Benth. & Hook. f.	Aratiku hata	Me, Fo

N°	Species and author	Common name in Spanish or Guaraní	Uses
87	<i>Qualea grandiflora</i> C. Mart.		Me, Fo, Co, Ind, MC, Mel
88	<i>Xylopia aromatica</i> (Lam.) C. Mart.	ka'i pimienta	Me, Fo, In
89	<i>Brosimum gaudichaudii</i> Trécul		Me, Fo, Me, Mel
90	<i>Casearia sylvestris</i> Sw.	Burro ka'a	Me, Fo, Mel, MC, Or
91	<i>Inga uraguensis</i> Hook. & Arn.	Inga guasu	Me, Fo, Or, Mel
92	<i>Genipa americana</i> L.	Ñandypa guasu	Me, Fo, Or, Mel
93	<i>Citrus aurantium</i> L.	Apepu, Naranja Hai	Me, Ind, Mel
94	<i>Bauhinia forficata</i> Link ssp. <i>pruinosa</i> (Vogel) Fortunato & Wunderlin	Pata de buey	Me, MC, Com, Or
95	<i>Anadenanthera colubrina</i> (Vell.) Brenan var. <i>cebil</i> (Griseb.) Altschul	Kurupay kuru	Me, MC, Ind, Com, Mel, Or
96	<i>Maclura tinctoria</i> (L.) Steud. ssp. <i>tinctoria</i>	Tata jyva	Me, MC, Or, Ind, Co, Mel
97	<i>Peltophorum dubium</i> (Spreng.) Taub.	Yvyra pyta	Me, Mc, Or, Mel
98	<i>Tabernaemontana catharinensis</i> A. DC.	Sapirangy	Me, Mel
99	<i>Handroanthus heptaphyllus</i> (Vell.) Mattos	tajy hu	Me, Mel
100	<i>Sapium haematospermum</i> Müll. Arg.	Kurupika'y	Me, Mel
101	<i>Cuphea lysimachioides</i> Cham. et Schltld.	Ysypo pere	Me, Mel
102	<i>Sida cordifolia</i> L.	Malva blanca	Me, Mel
103	<i>Trichilia elegans</i> A. Juss.	Katigua'i	Me, Mel
104	<i>Eugenia uniflora</i> L.	Ñangapiry	Me, Mel
105	<i>Scoparia dulcis</i> L.	Typycha kuratu	Me, Mel
106	<i>Allophylus edulis</i> (A. St.-Hil., A. Juss. & Cambess.) Hieron. ex Nederl.	Koku	Me, Mel
107	<i>Luehea divaricata</i> Mart.	Ka'a oveti	Me, Mel, Co, Fo, MC
108	<i>Croton urucurana</i> Baill.	Sangre de Drago, Sangre de Grado, Uruku Râ, Pyuchu	Me, Mel, Com
109	<i>Plenckia populnea</i> Reissek		Me, Or, MC
110	<i>Handroanthus ochraceus</i> (Cham.) Mattos ssp. <i>ochraceus</i>	Tajy sa'y ju	Me, Or, MC, Ind
111	<i>Machaerium acutifolium</i> Vogel		Me, Or, MC, Mel
112	<i>Echinodorus grandiflorus</i> (Cham. & Schltld.) Micheli	Cucharero	Mel
113	<i>Butia paraguayensis</i> (Barb. Rodr.) L.H. Bailey	Jata'i	Mel
114	<i>Commelina erecta</i> L.	Santa lucia hovy	Mel
115	<i>Pontederia azurea</i> Sw.	Aguape puru'a	Mel
116	<i>Pontederia cordata</i> L. var. <i>cordata</i>	Camalote	Mel
117	<i>Aspidosperma australe</i> Müll. Arg.	Kirandy	Mel
118	<i>Aspidosperma tomentosum</i> C. Mart.	kirandy del cerrado	Mel
119	<i>Aspilia montevidensis</i> (Spreng.) Kuntze		Mel
120	<i>Vernonanthura chamaedrys</i> (Less.) H. Rob.	Typycha moroti	Mel
121	<i>Celtis iguanaea</i> (Jacq.) Sarg.	Juasy'y	Mel
122	<i>Monteverdia ilicifolia</i> (Mart. ex Reissek) Biral	Cangorosa	Mel
123	<i>Diospyros lasiocalyx</i> (Mart.) B. Walln.		Mel
124	<i>Acosmium subelegans</i> (Mohlenbr.) Yakovlev		Mel
125	<i>Andira humilis</i> Mart. ex Benth.		Mel
126	<i>Samanea tubulosa</i> (Benth.) Barneby & J.W. Grimes	Manduvi ra	Mel
127	<i>Pleurophora saccocarpa</i> Koehne		Mel

N°	Species and author	Common name in Spanish or Guaraní	Uses
128	<i>Eugenia moraviana</i> O. Berg		Mel
129	<i>Myrcianthes pungens</i> (O. Berg) D. Legrand	Guaviju	Mel
130	<i>Phyllanthus chacoensis</i> Morong	Jakare pito	Mel
131	<i>Scoparia montevidensis</i> (Spreng.) R. E. Fr.		Mel
132	<i>Rhamnidium elaeocarpum</i> Reissek	Taruma'i	Mel
133	<i>Spermacoce verticillata</i> L.	typycha corredor	Mel
134	<i>Zanthoxylum caribaeum</i> Lam. ssp. <i>rugosum</i> (A. St.-Hil. & Tul.) Reynel	Tembetary hu	Mel
135	<i>Xylosma venosa</i> N.E. Br.	Ñuati pyta	Mel
136	<i>Talisia angustifolia</i> Radlk.	Yvyra'i ka'i	Mel
137	<i>Copernicia alba</i> Morong	karanda'y	Mel, Co, Mc, In
138	<i>Calycophyllum multiflorum</i> Griseb.	Palo blanco	Mel, Com, MC
139	<i>Balfourodendron riedelianum</i> (Engl.) Engl.	Guatambu	Mel, In, MC
140	<i>Tabebuia aurea</i> (Silva Manso) Benth. & Hook. f. ex S. Moore	Paratodo	Mel, MC, Or, Ind, Fo, Co
141	<i>Bidens pilosa</i> L.	kapiuna	Mel, Me
142	<i>Acrocomia aculeata</i> (Jacq.) Lodd. ex Mart.	mbokaja	Mel, Me, Co, In, Or
143	<i>Agonandra brasiliensis</i> Miers ex Benth. & Hook. f.		Mel, Me, Fo, Ind, Co, MC
144	<i>Terminalia argentea</i> Mart.	Capitán	Mel, Me, Or, MC, Ind
145	<i>Attalea phalerata</i> Mart. ex Spreng.	Guacuri	Mel, Or, Fo, Co, Me, MC
146	<i>Jacaranda mimosifolia</i> D. Don	Jakaranda	Mel, Or, Me
147	<i>Prestonia tomentosa</i> R. Br.		Or
148	<i>Cereus stenogonus</i> K. Schum.	Tuna	Or, Co
149	<i>Opuntia elata</i> Link & Otto ex Salm-Dyck var. <i>cardiosperma</i> (K. Schum) R. Kiesling	Tuna de perro	Or, Co, Me
150	<i>Ceiba</i> sp.	samu'u	Or, Co, Me, In
151	<i>Tibouchina</i> sp.1	flor de cuaresma	Or, Fo
152	<i>Tocoyena formosa</i> (Cham. & Schltdl.) K. Schum.		Or, Fo
153	<i>Tapirira guianensis</i> Aubl.	ka'ambota	Or, Fo, In
154	<i>Chrysophyllum gonocarpum</i> (Mart. & Eichler) Engl.	Aguai	Or, Fo, MC, Co
155	<i>Guarea macrophylla</i> Vahl ssp. <i>spiciflora</i> (A. Juss.) T.D. Penn.	Cedrillo	Or, Fo, MC, Mel
156	<i>Guettarda viburnoides</i> Cham. & Schltdl.	angélica	Or, MC, Co, Fo
157	<i>Machaerium hirtum</i> (Vell.) Stellfeld		Or, MC, Me, Mel
158	<i>Psychotria carthagenensis</i> Jacq.	cafecito; maría molle	Or, Me
159	<i>Guarea guidonia</i> (L.) Sleumer	Cedro blanco	Or, Me, Fo, MC
160	<i>Cupania vernalis</i> Cambess.	Jagua rata'y pyta	Or, Mel, MC, Com
161	<i>Magonia pubescens</i> A. St.-Hil.	Yvyra hy'a	Or, Mel, Me, Ind, MC
162	<i>Plathymenia reticulata</i> Benth.	morosyvo sa'yju	Or, Mel, Me, MC, Ind

Ref.: Me (Medicinal); Mel (Meliferous); Co (Edible); Tin (dyeing properties); Fo (Forage); Mc (Building material); Or (Ornamental); Com (Fuel); Cos (Cosmetics); In (Industrial); To (Toxic)

The following is a selection of photographs of some species recorded

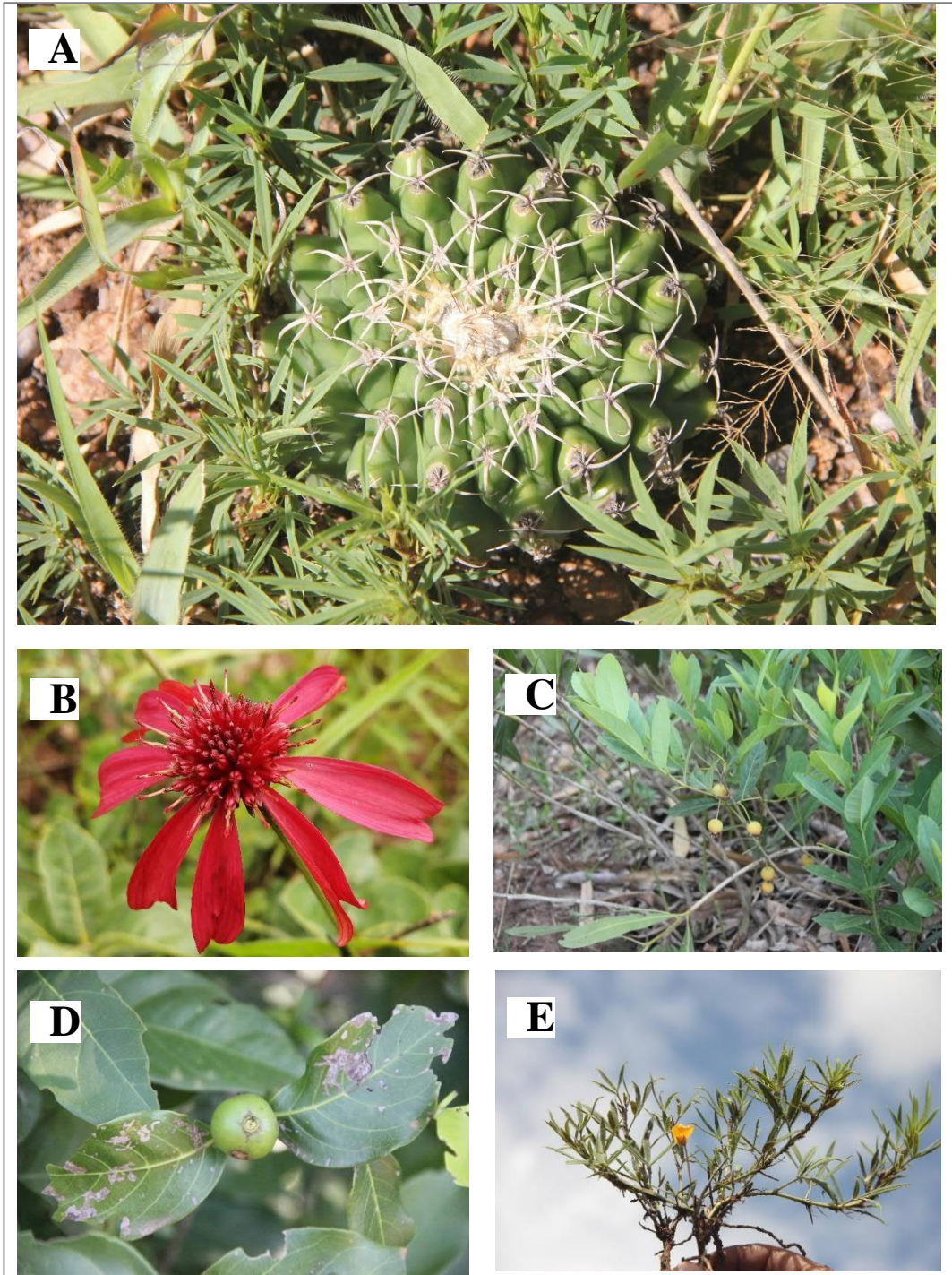


Figure 44 – *Discocactus hartmanii* (CR), B: *Bidens chodatii*, C: *Campomanesia adamantium*, D: *Cordia sessilis*, E: *Arachis pflugeae* (Lidia Pérez de Molas; L. González Soria)

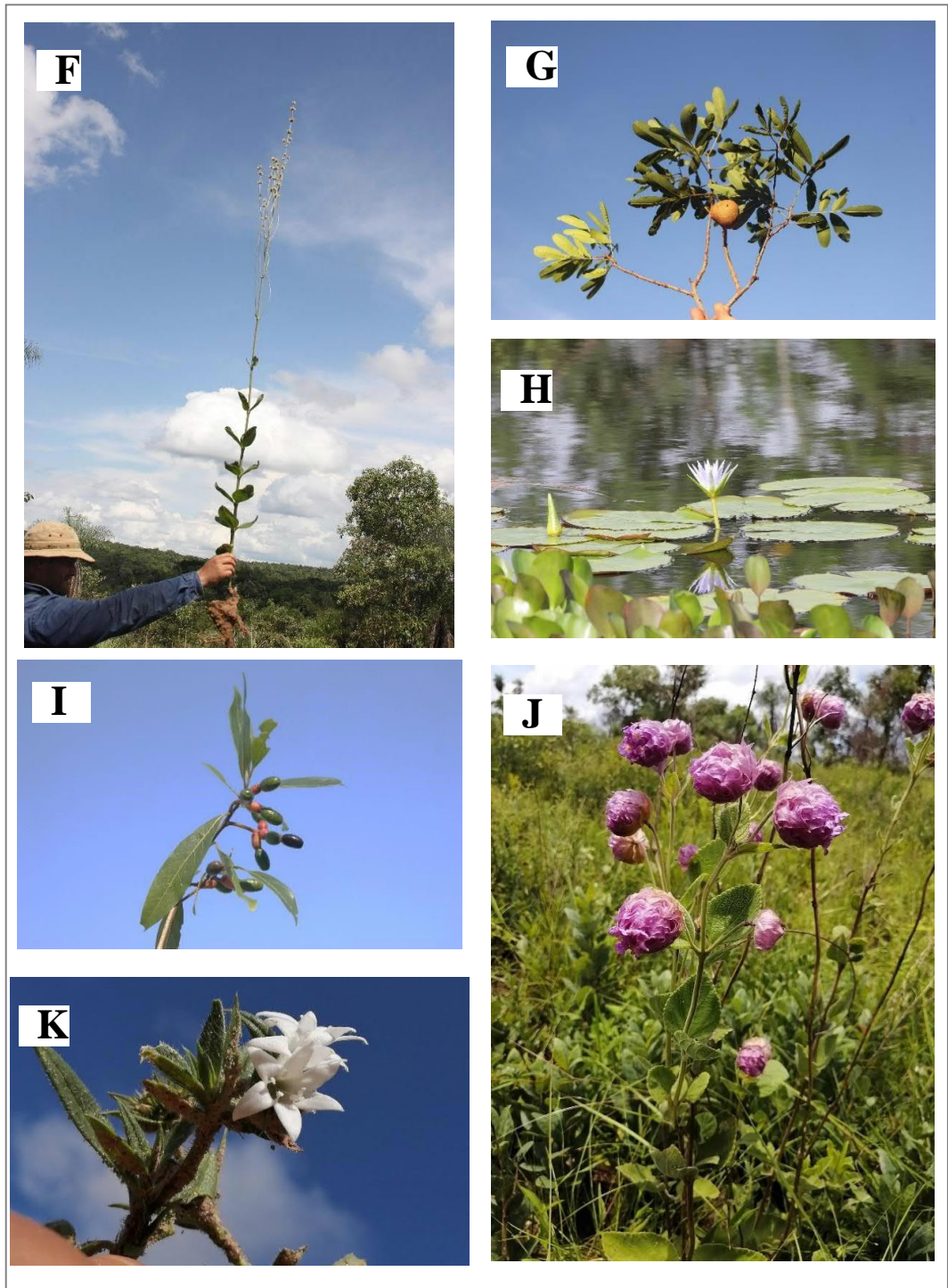


Figure 45 – *Froelichia procera*, G: *Magonia pubescens*, H: *Nymphaea prolifera*, I: *Ocotea minarum*, J: *Lippia lupulina*, K: *Richardia grandiflora*. (Lidia Pérez de Molas; L. González Soria)

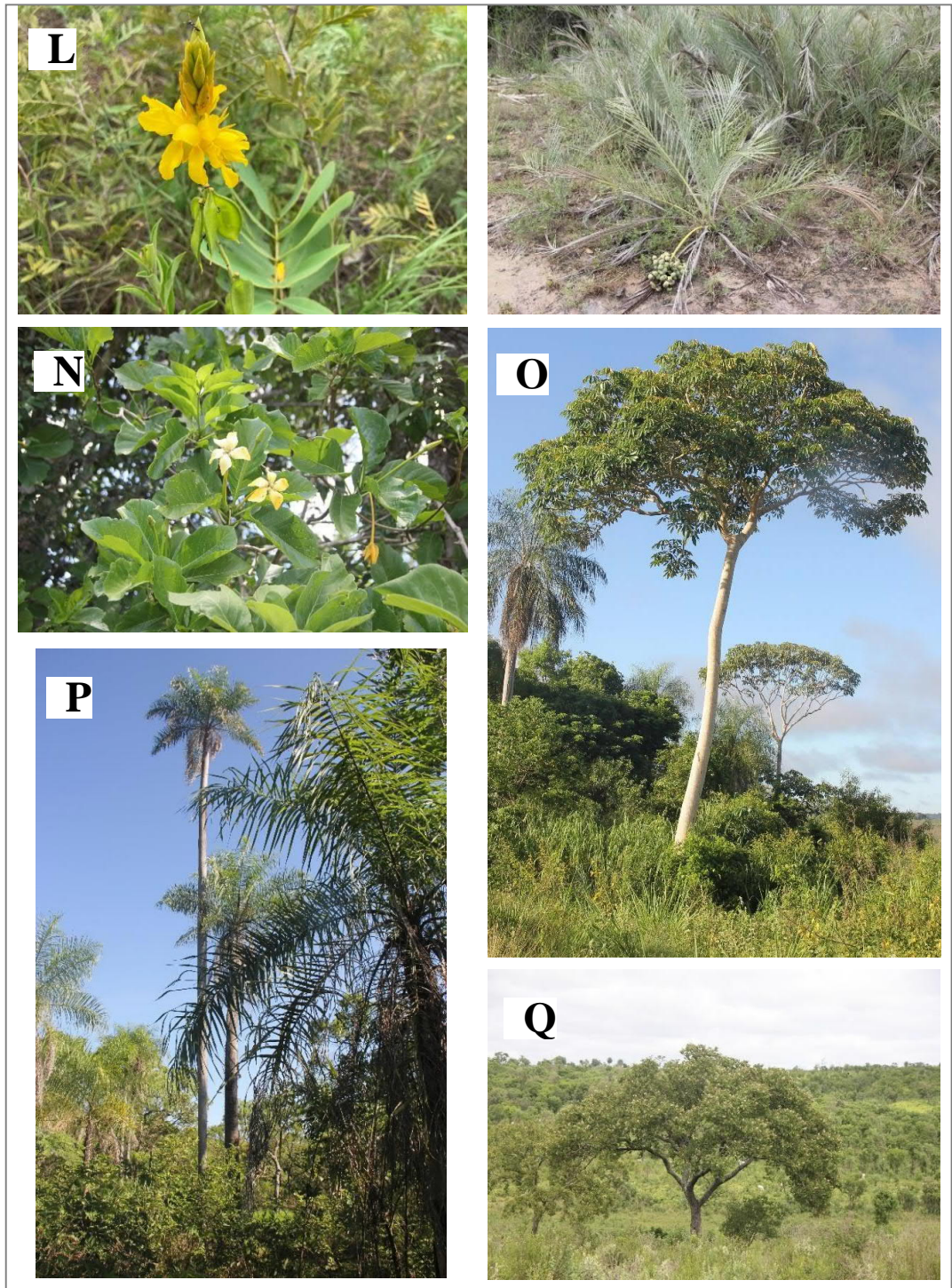


Figure 46 – *Senna paradyction*, M: *Syagrus campylospatha*, N: *Tocoyena formosa*, O: *Didymopanax morototoni*, P: *Acrocomia aculeata*, Q: *Hymenaea martiana*. (Lidia Pérez de Molas; L. González Soria)

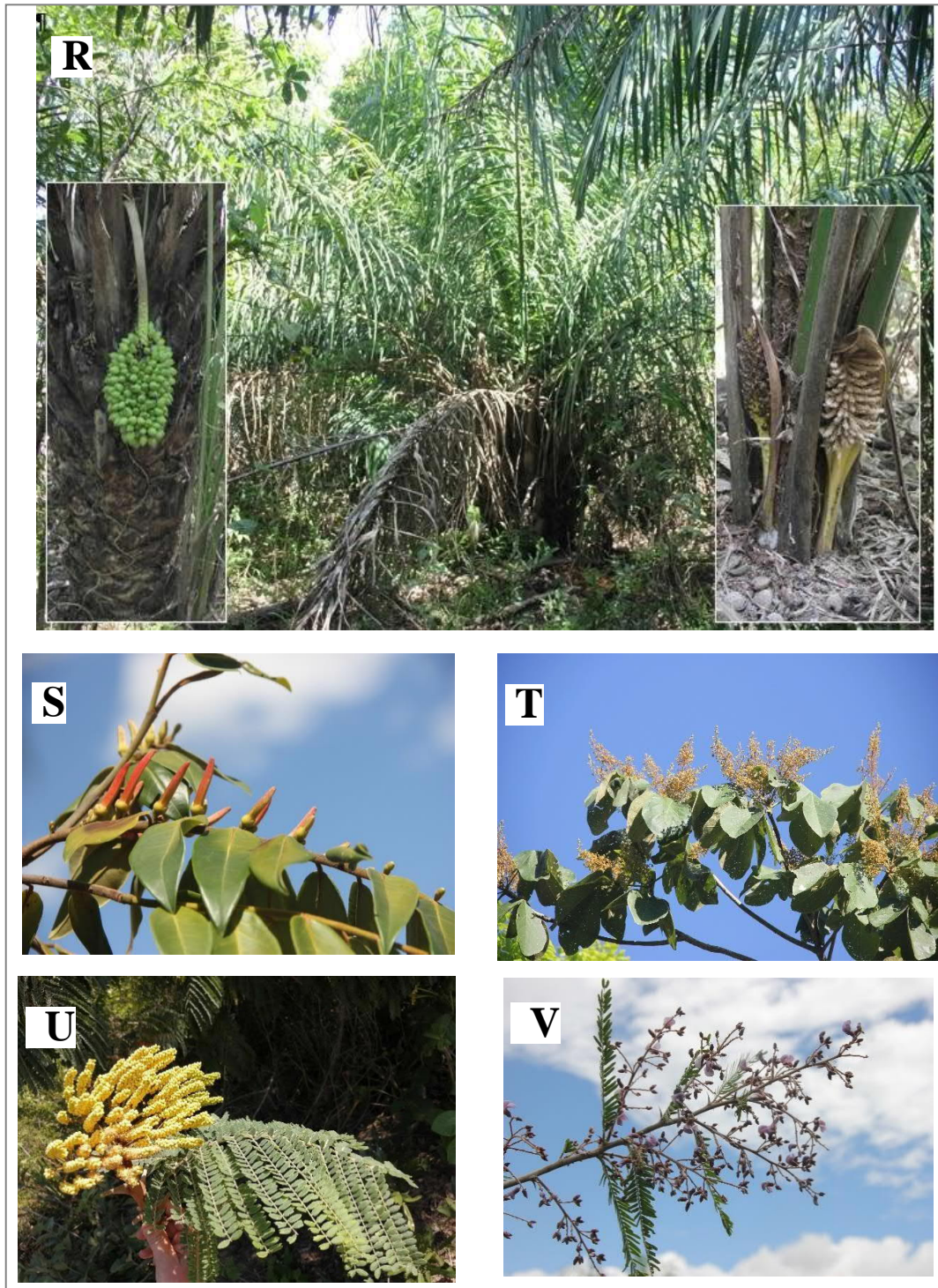


Figure 47 – *Attalea phalerata*, S: *Xylopia aromática*, T: *Sterculia striata*, U: *Dimorphandra mollis*, V: *Machaerium hirtum*.

6.1.4 Terrestrial Fauna Seasonal Results

The monitoring campaign was carried out in the rainy season, in november 2020 and february 2021. The dry season monitoring campaign was carried out in may 2021.

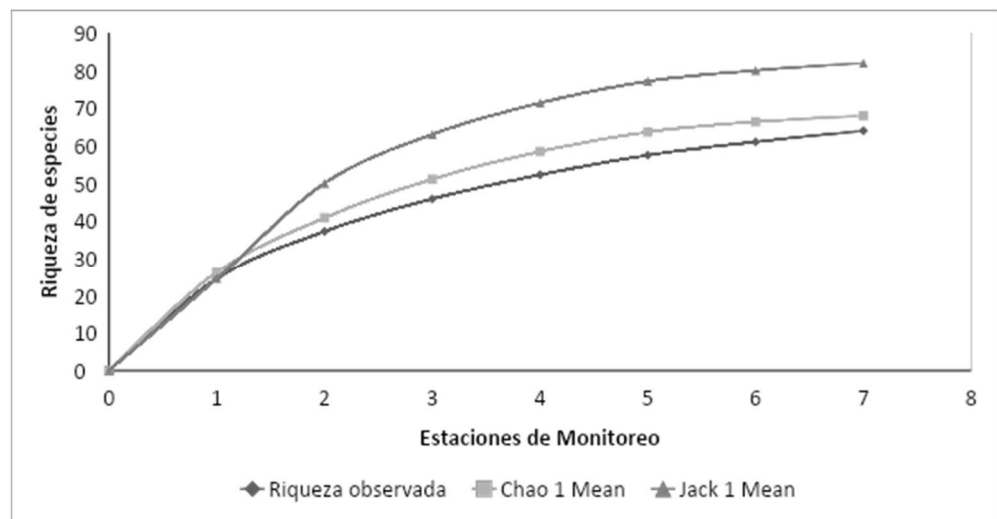
6.1.4.1 Primary Seasonal Data – Rainy Season

Ichthyological survey

In terms of abundance, *Odontostilbe pequirá* is the most frequent fish species in the seven sampling areas (properties) with 470 (26.14%) individuals, followed by *Corydoras aeneus* (153- 8,5%) y *Moenkhausia dichrourea* (108 – 6%). There are eight species for which only one individual was captured during the entire monitoring. The 64 species of ichthyofauna recorded represent 21% of the Paraguayan ichthyofauna, according to the checklist of Koerber, Vera & Reis (2017), and together with the methodology used, have been included in the photographic record.

The Characidae family is the richest with 18 species (Ichthyology (fish) annex). With regard to threatened species, it can be mentioned that *Potamorhaphis eigenmanni* is VU (Vulnerable) according to MADES Resolution 1563/09 and *Odontostilbe pequirá* (mojarra) is categorized by IUCN as LC (Least Concern) at a regional level. Santa Teresa sampling area held the highest richness (see List of species by sampling areas with 32 species, while the San Liberato sampling area/site presented the lowest richness with only 10 species. The mojarra *Moenkhausia dichrourea* was the only species to be present at all of the ranches, while *Odontostilbe pequirá* is the most abundant species. Ten species (20%) are used for subsistence fishing, while seven are used in commercial fishing and 18 are used for ornamental purposes (see Usage of recorded species in different fishing practices.likely that fish from the Heptapteridae family (catfish) could typically be considered the most desirable species in terms of subsistence fishing.

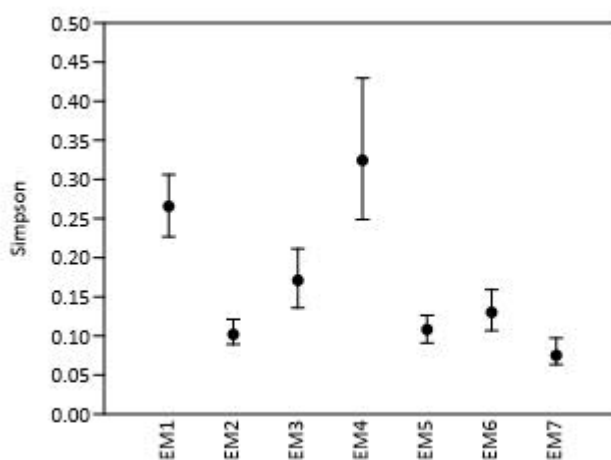
Figure 48 – Species accumulation curve



EM1= Gavilán; EM2= Trementina; EM3= Soledad; EM4= San Liberato; EM5= Santa Teresa; EM6= Zapallo; EM7= Hermosa.

Through the species richness estimators, using the data obtained in the surveys carried out (64 species) in the study area, it is estimated that approximately 68 species (95% confidence limits: 64.85 - 82.91 species) could be recorded in the area, with the same sampling effort (Chao1). However, the species accumulation curve obtained through the Chao1 and Jack1 estimators (Colwell 2005) shows that species with greater sampling effort will still continue to be found due to the fact that the curve does not reach a plateau, According to these estimators, between 78.04% and 94.11% of the expected species were observed.

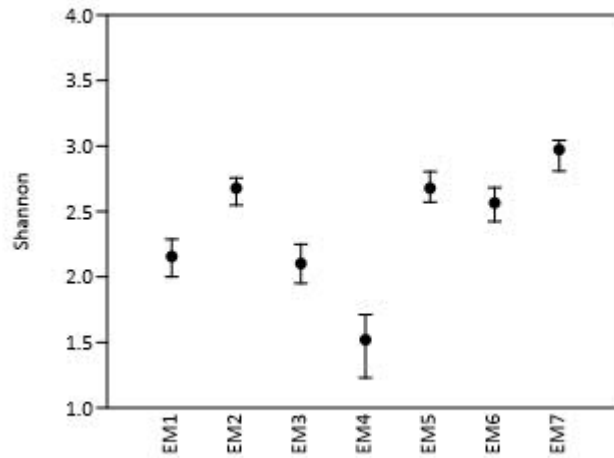
Figure 49 – Simpson’s Dominance



*EM1= Gavilán; EM2= Trementina; EM3= Soledad; EM4= San Liberato;
EM5= Santa Teresa; EM6= Zapallo; EM7= Hermosa.*

The Simpson index represents the probability that two individuals, within a habitat, selected at random, belong to the same species. In other words, the closer the value of this index is to unity, there is a greater possibility of dominance of a species and a population; and the closer the value of this index is to zero, the greater is the biodiversity of a habitat (Magurran, 1988). According to this index, the dominance fluctuates between 0.07522 (EM7) and 0.3245 (EM2).

Figure 50 – Equity Index (Shannon-Wieber)



*EM1= Gavilán; EM2= Trementina; EM3= Soledad; EM4= San Liberato;
EM5= Santa Teresa; EM6= Zapallo; EM7= Hermosa.*

The Shannon index expresses the uniformity of the importance values across all the species in the sample; and it measures the average degree of uncertainty in predicting to which species an individual chosen at random from a collection belongs (Magurran, 1988; Peet, 1974; Baev and Penev, 1995). It assumes that individuals are randomly selected and that all species are present in the sample. It acquires values between zero, when there is only one species, and the natural logarithm of S ($64 = 4.158$), when all species are represented by the same number of individuals (Magurran, 1988). In this first monitoring, the values fluctuate between 1.52 (EM4) and 2.973 (EM2).

Table 9 – The ichthyofauna and its taxonomy

	<i>Species</i>	<i>Author</i>	<i>Common name</i>	<i>Distribution</i>
ACTINOPTERI				
CHARACIFORMES				
Acestrorhynchidae				
1	<i>Acestrorhynchus pantaneiro</i>	Menezes 1992	Pirá jaguá	Native
Serrasalmidae				
2	<i>Serrasalmus marginatus</i>	Valenciennes 1837	Piraña	Native
Parodontidae				
3	<i>Parodon nasus</i>	Valenciennes, 1850	Violito	Native
Anostomidae				
4	<i>Megaleporinus obtusidens</i>	Valenciennes, 1837	Boga	Native
Curimatidae				
5	<i>Curimatopsis sp</i>	Steindachner, 1876	Carimbataí	Native
6	<i>Potamorhina squamoralevis</i>	Braga & Azpelicueta 1983	Blanquillo	Native
7	<i>Steindachnerina brevipinna</i>	Eigenmann & Eigenmann, 1889	Carimbataí	Native
Erythrinidae				
8	<i>Hoplias misionera</i>	Rosso, Mabragaña, González-Castro, Delpiani, Avigliano, Schenone & Díaz de Astarloa, 2016	Tararira	Native
Lebiasinidae				
9	<i>Pyrrhulina australis</i>	Eigenmann & Kennedy, 1903	Pirrulina	Native
Triporthidae				
10	<i>Triporthus pantanensis</i>	Malabarba, 2004	Pechito	Native
Characidae				
11	<i>Charax leticiae</i>	Lucena, 1987	Dientudo jorobado	Native
12	<i>Astyanax lacustris</i>	Lütken 1875	Mojarra	Native
13	<i>Astyanax lineatus</i>	Perugia, 1891	Mojarra	Native
14	<i>Psellogrammus kennedyi</i>	Eigenmann, 1903	Mojarra	Native
15	<i>Bryconops melanurus</i>	Bloch, 1794	Mojarra	Native
16	<i>Hemigrammus ulreyi</i>	Boulenger, 1895	Mojarra	Nativa
17	<i>Bryconamericus exodon</i>	Eigenmann, 1907	Mojarra	Nativa
18	<i>Moenkhausia dichroua</i>	Kner, 1858	Mojarra	Native
19	<i>Moenkhausia bonita</i>	Benine, Castro & Sabino 2004	Mojarra	Native
20	<i>Moenkhausia sanctaefilomenae</i>	Steindachner, 1907	Mojarra	Native
21	<i>Odontostilbe pequirá</i>	Steindachner, 1882	Mojarra	Native
22	<i>Serrapinnus sp.</i>	Malabarba, 1998	Mojarra	Native
23	<i>Gymnocorymbus ternetzi</i>	Boulenger, 1895)	Monjita	Native

	<i>Species</i>	<i>Author</i>	<i>Common name</i>	<i>Distribution</i>
24	<i>Poptella paraguayensis</i>	Eigenmann, 1907	Mojarra	Native
25	<i>Tetragonopterus argenteus</i>	Cuvier, 1816	Mojarra	Native
26	<i>Hyphessobrycon eques</i>	Steindachner, 1882	Mojarra	Native
27	<i>Aphyocharax anisitsi</i>	Eigenmann & Kennedy, 1903	Mojarra	Native
28	<i>Aphyocharax rathbuni</i>	Eigenmann, 1907	Mojarra	Native
Crenuchidae				
29	<i>Characidium sp.</i>	Reinhardt, 1867	Mojarra	Native
30	<i>Characidium sp.1</i>	Reinhardt, 1867	Mojarra	Native
31	<i>Characidium sp.2</i>	Reinhardt, 1867	Mojarra	Native
SILURIFORMES				
Auchenipteridae				
32	<i>Trachelyopterus galeatus</i>	Linnaeus 1766	Apretador	Native
Doradidae				
33	<i>Pterodoras granulosus</i>	Valenciennes 1821	Armado	Native
34	<i>Platydoras armatulus</i>	Valenciennes, 1840	Armado	Native
Pimelodidae				
35	<i>Pimelodus maculatus</i>	Lacépède, 1803	Mandi-í	Native
Pseudopimelodidae				
36	<i>Microglanis carlae</i>	Vera-Alcaraz, da Graça & Shibatta 2008	Bagre de la piedras	Native
37	<i>Pseudopimelodus sp.</i>	Bleeker 1858	Manguruyu	Native
Heptapteridae				
38	<i>Rhamdia sp.</i>	Bleeker 1858	Jurundi-á	Native
39	<i>Rhamdia quelen</i>	(Quoy & Gaimard, 1824)	Jurundi-á	Native
40	<i>Pimelodella sp.</i>	Eigenmann & Eigenmann, 1888	Mandi-í	Native
41	<i>Pimelodella gracilis</i>	Valenciennes, 1835	Mandi-í	Native
42	<i>Pimelodella sp.1</i>	Eigenmann & Eigenmann, 1888	Mandi-í cobí	Native
Aspredinidae				
43	<i>Amaralia oviraptor</i>	Friel & Carvalho, 2016	Guitarrita	Native
Callichthyidae				
44	<i>Corydoras aeneus</i>	Gill, 1858	Tachuela	Native
45	<i>Corydoras aurofrenatus</i>	Eigenmann & Kennedy, 1903	Tachuela	Native
46	<i>Corydoras hastatus</i>	Eigenmann & Eigenmann, 1888	Tachuela	Native
Trichomycteridae				
47	<i>Paravandellia oxyptera</i>	Miranda Ribeiro, 1912	Candiru	Native
Loricariidae				
48	<i>Otocinclus sp.</i>	Cope, 1871	Limpia vidrio	Native
49	<i>Otothyropsis sp.</i>	Ribeiro, Carvalho & Melo, 2005	Limpia vidrio	Native
50	<i>Ancistrus pirareta</i>	Muller, 1989	Vieja de agua	Native

	<i>Species</i>	<i>Author</i>	<i>Common name</i>	<i>Distribution</i>
51	<i>Hypostomus sp.</i>	Lacepède, 1803	Vieja de agua	Native
52	<i>Loricaria sp.</i>	Linnaeus, 1758	Vieja de agua	Native
53	<i>Rineloricaria aurata</i>	Knaack, 2002	Vieja de agua	Native
54	<i>Rineloricaria lanceolata</i>	Guenther, 1868	Vieja de agua	Native
GYMNOTIFORMES				
Sternopygidae				
55	<i>Eigenmannia trilineata</i>	López & Castello, 1966	Banderira	Native
Rhamphichthyidae				
56	<i>Gymnorhamphichthys britskii</i>	Carvalho, Ramos & Albert, 2011	Morenita	Native
Hypopomidae				
57	<i>Brachyhypopomus gauderio</i>	Giora & Malabarba, 2009	Morenita	Native
Gymnotidae				
58	<i>Gymnotus pantanal</i>	Fernandes, Albert, Daniel-Silva, Lopes, Crampton & Almeida-Toledo, 2005	Morenita	Native
BELONIFORMES				
Belonidae				
59	<i>Potamorhaphis eigenmanni</i>	Miranda Ribeiro, 1915	Pez aguja	Native
CICHLIFORMES				
Cichlidae				
60	<i>Bujurquina vittata</i>	Heckel, 1840	Acara de bandas	Native
61	<i>Cichlasoma dimerus</i>	Heckel, 1840	Chanchita	Native
62	<i>Crenicichla lepidota</i>	Heckel, 1840	Juanita	Native
63	<i>Crenicichla mandelburgeri</i>	Kullander, 2009	Juanita	Native
64	<i>Gymnogeophagus balzanii</i>	Perugia, 1891	Acará	Native

Table 10 – List of species with common names in Spanish, Guarani and English

Nº	Species	Spanish	Guarani	English
1	<i>Acestrorhynchus pantaneiro</i>	Dientudo	Pirá jaguá	Pike characin
2	<i>Serrasalmus marginatus</i>	Piraña	Pira ãña	Piranha
3	<i>Paradon nasus</i>	Virolito		Scrapetooth
4	<i>Megaleporinus obtusidens</i>	Boga	Pira petei	Headstander
5	<i>Steindachnerina brevipinna</i>	Sabalito	Carimbataí	Toothless Characin
6	<i>Potamorhina squamoralevis</i>	Blanquillo		Characin
7	<i>Hoplias misionera</i>	Tararira	Tare`yi	wolf fish
8	<i>Pyrrhulina australis</i>	Pirrulina	Piky	Pencilfish
9	<i>Triportheus pantanensis</i>	Pechito	Pirá Guyra	Characin
10	<i>Charax leticiae</i>	Dientudo jorobado		Characin
11	<i>Astyanax lacustris</i>	Mojarra	Piky	Tetra
12	<i>Astyanax lineatus</i>	Mojarra	Piky	Tetra
13	<i>Psellogrammus kennedyi</i>	Mojarrita	Piky	Tetra
14	<i>Hemigrammus ulreyi</i>	Mojarrita	Piky	Tetra
15	<i>Bryconamericus exodon</i>	Mojarrita	Piky	Tetra
16	<i>Moenkhausia dichroua</i>	Colita negra	Piky	Tetra
17	<i>Moenkhausia bonita</i>	Colita negra	Piky	Tetra
18	<i>Moenkhausia sanctaefilomenae</i>	Colita negra	Piky	Tetra
19	<i>Odontostilbe pequirá</i>	Mojarra	Piky	Tetra
20	<i>Gymnocorymbus ternetzi</i>	Monjita	Piky	Black tetra
21	<i>Poptella paraguayensis</i>	Pechito	Piky	Tetra
22	<i>Tetragonopterus argenteus</i>	Relojito	Piky	Tetra
23	<i>Hyphessobrycon eques</i>	Mojarra/Tetra	Piky	Tetra
24	<i>Aphyocharax anisitsi</i>	Mojarra/Colita roja	Piky	Bloodfin tetra
25	<i>Aphyocharax rathbuni</i>	Tetra/Aleta de sangre	Piky	Redflank bloodfin
26	<i>Characidium sp.</i>	Mojarra/Tetra	Piky	Characin
27	<i>Characidium sp.1</i>	Mojarra/Tetra	Piky	Characin
28	<i>Characidium sp.2</i>	Mojarra/Tetra	Piky	Characin
29	<i>Trachelyopterus galeatus</i>	Apretador	Tajopy	Driftwood catfish
30	<i>Pterodoras granulosus</i>	Armado		Granulated catfish
31	<i>Platydoras armatulus</i>	Armado		Granulated catfish
32	<i>Pimelodella sp.</i>	Bagre cantor	Mandi-í	Catfish
33	<i>Pimelodella sp.1</i>	Bagre cantor	Mandi-í cobí	Catfish
34	<i>Rhamdia sp.</i>	Bagre sapo	Jurundi-á	Pale catfish
35	<i>Rhamdia quelen</i>	Bagre sapo	Jurundi-á	Pale catfish
36	<i>Amaralia oviraptor</i>	Guitarrita		Banjo catfish
37	<i>Corydoras aurofrenatus</i>	Tachuela	Pira kure	Armored catfish
38	<i>Corydoras aeneus</i>	Tachuela	Pira kure	Armored catfish

N°	Species	Spanish	Guarani	English
39	<i>Corydoras hastatus</i>	Tachuela	Pira kure	Armored catfish
40	<i>Ancistrus pirareta</i>	Vieja de agua	Guaimingue	Armored catfish
41	<i>Rineloricaria aurata</i>	Vieja de agua	Guaimingue	Dward sucking catfish
42	<i>Otocinclus sp.</i>	Limpia vidrio		Glass knifefish
43	<i>Eigenmannia trilineata</i>	Banderira		Bluntnose knifefish
44	<i>Brachyhypopomus gauderio</i>	Morenita		Naked-back knifefish
45	<i>Gymnotus pantanal</i>	Morenita		Needle fish
46	<i>Potamorrhaphis eigenmanni</i>	Pez aguja		Banded acara
47	<i>Bujurquina vittata</i>	Acara de bandas		Acara
48	<i>Cichlasoma dimerus</i>	Chanchita	Pira coco	Pike cichlid
49	<i>Crenicichla lepidota</i>	Juanita	Pira kygua	Paraguay mouthbrooder
50	<i>Gymnogeophagus balzanii</i>	Chanchita	Acará	Catfish
51	<i>Pseudopimelodus sp.</i>	Manguruyu	Manguruju	Catfish
52	<i>Crenicichla mandelburgeri</i>	Juanita	Pira kygua	Pike cichlid
53	<i>Gymnorhamphichthys britskii</i>	Morenita		Knifefish
54	<i>Rineloricaria lanceolata</i>	Vieja de agua	Guaimingue	Chocolate-colored catfish
55	<i>Loricaria sp.</i>	Vieja de agua	Guaimingue	Armored catfish
56	<i>Hypostomus sp.</i>	Limpia vidrio		Armored catfish
57	<i>Pimelodella gracilis</i>	Bagre	Mandi-í	Graceful pimelodella
58	<i>Microglanis carlae</i>	Bagre de las rocas		Dwarf marbled catfi
59	<i>Pimelodus maculatus</i>	Bagre	Mandi-í	Long-whiskered catfish
60	<i>Serrapinnus sp.</i>	Mojarra	Piky	Characin
61	<i>Curimatopsis sp</i>	Curimba	Piky	Toothless characin
62	<i>Bryconops melanurus</i>	Mojarrita	Piky	Characin
63	<i>Otothyropsis sp.</i>	Limpia vidrio	Guaimingue	Armored catfish
64	<i>Paravandellia oxyptera</i>	Sanguijuela		Paraguay River candiru

Table 11 – List of species by sampling areas

N°	Species	Gav	Tre	Sol	S. Lib	Sta. Ter	Zap	Her
1	<i>Acestrorhynchus pantaneiro</i>	x				x		
2	<i>Serrasalmus marginatus</i>	x						
3	<i>Paradon nasus</i>			x				
4	<i>Megaleporinus obtusidens</i>	x				x		
5	<i>Steindachnerina brevipinna</i>	x	x					
6	<i>Potamorhina squamoralevis</i>	x					x	

N°	Species	Gav	Tre	Sol	S. Lib	Sta. Ter	Zap	Her
7	<i>Hoplias misionera</i>	x	x		x	x	x	x
8	<i>Pyrrhulina australis</i>	x	x			x	x	
9	<i>Triportheus pantanensis</i>	x	x					
10	<i>Charax leticiae</i>		x					
11	<i>Astyanax lacustris</i>		x	x	x	x	x	x
12	<i>Astyanax lineatus</i>		x		x	x	x	x
13	<i>Psellogrammus kennedyi</i>	x	x	x				x
14	<i>Hemigrammus ulreyi</i>		x			x		
15	<i>Bryconamericus exodon</i>	x				x	x	x
16	<i>Moenkhausia dichrourea</i>	x	x	x		x	x	x
17	<i>Moenkhausia bonita</i>	x	x			x	x	x
18	<i>Moenkhausia sanctaefilomenae</i>	x		x		x	x	x
19	<i>Odontostilbe pequirá</i>	x	x		x	x	x	x
20	<i>Gymnocorymbus ternetzi</i>	x	x			x		
21	<i>Poptella paraguayensis</i>		x			x	x	x
22	<i>Tetragonopterus argenteus</i>	x					x	
23	<i>Hyphessobrycon eques</i>	x	x	x		x	x	x
24	<i>Aphyocharax anisitsi</i>	x	x	x		x	x	x
25	<i>Aphyocharax rathbuni</i>	x	x					
26	<i>Characidium sp.</i>	x		x	x			
27	<i>Characidium sp.1</i>		x	x	x			x
28	<i>Characidium sp.2</i>			x			x	x
29	<i>Trachelyopterus galeatus</i>		x					
30	<i>Pterodoras granulosus</i>		x					
31	<i>Platydoras armatulus</i>		x					
32	<i>Pimelodella sp.</i>	x	x	x		x	x	x
33	<i>Pimelodella sp.1</i>	x						x
34	<i>Rhamdia sp.</i>			x				
35	<i>Rhamdia quelen</i>	x					x	x
36	<i>Amaralia oviraptor</i>	x						
37	<i>Corydoras aurofrenatus</i>					x		x
38	<i>Corydoras aeneus</i>			x		x		x
39	<i>Corydoras hastatus</i>	x						
40	<i>Ancistrus pirareta</i>		x		x	x		
41	<i>Rineloricaria aurata</i>				x			
42	<i>Otocinclus sp.</i>				x	x	x	x
43	<i>Eigenmannia trilineata</i>	x						
44	<i>Brachyhyopomus gauderio</i>	x						
45	<i>Gymnotus pantanal</i>	x				x		
46	<i>Potamorhaphis eigenmanni</i>	x				x		
47	<i>Bujurquina vittata</i>	x	x					
48	<i>Cichlasoma dimerus</i>		x	x		x	x	x

N°	Species	Gav	Tre	Sol	S. Lib	Sta. Ter	Zap	Her
49	<i>Crenicichla lepidota</i>	x				x	x	x
50	<i>Gymnogeophagus balzanii</i>		x					x
51	<i>Pseudopimelodus sp.</i>				x			
52	<i>Crenicichla mandelburgeri</i>							x
53	<i>Gymnorhamphichthys britskii</i>					x		
54	<i>Rineloricaria lanceolata</i>							x
55	<i>Loricaria sp.</i>							x
56	<i>Hypostomus sp.</i>					x	x	
57	<i>Pimelodella gracilis</i>							x
58	<i>Microglanis carlae</i>					x		
59	<i>Pimelodus maculatus</i>						x	
60	<i>Serrapinnus sp.</i>					x		x
61	<i>Curimatopsis sp</i>						x	x
62	<i>Bryconops melanurus</i>					x		
63	<i>Otothyropsis sp.</i>					x	x	x
64	<i>Paravandellia oxyptera</i>					x	x	
	Total of species per sampling area	31	26	14	10	32	25	29

Ref.: Gav: Gavilán; Tre: Trementina; Sol: Soledad; S. Lib: San Liberato; Sta. Ter: Sta Teresa; Zap: Zapallo; Her: Hermosa

Table 12 – Usage of recorded species in different fishing practices.

N	Scientific names	Subsistence	Commercial	Ornamental
1	<i>Acestrorhynchus pantaneiro</i>	X	X	
2	<i>Serrasalmus marginatus</i>	X	X	
3	<i>Paradon nasus</i>			X
4	<i>Megaleporinus obtusidens</i>	X	X	
5	<i>Steindachnerina brevipinna</i>			X
6	<i>Potamorhina squamoralevis</i>	X		
7	<i>Hoplias misionera</i>	X	X	
8	<i>Pyrrhulina australis</i>			
9	<i>Triporthus pantanensis</i>			X
10	<i>Charax leticiae</i>			
11	<i>Astyanax lacustris</i>			X
12	<i>Astyanax lineatus</i>			X
13	<i>Psellogrammus kennedyi</i>			
14	<i>Hemigrammus ulreyi</i>			X
15	<i>Bryconamericus exodon</i>			X
16	<i>Moenkhausia dichroua</i>			X
17	<i>Moenkhausia bonita</i>			X
18	<i>Moenkhausia sanctaefilomenae</i>			X
19	<i>Odontostilbe pequirá</i>			X
20	<i>Gymnocorymbus ternetzi</i>			X

N	Scientific names	Subsistence	Commercial	Ornamental
21	<i>Poptella paraguayensis</i>			
22	<i>Tetragonopterus argenteus</i>			
23	<i>Hyphessobrycon eques</i>			X
24	<i>Aphyocharax anisitsi</i>			X
25	<i>Aphyocharax rathbuni</i>			X
26	<i>Characidium</i> sp.			
27	<i>Characidium</i> sp.1			
28	<i>Characidium</i> sp.2			
29	<i>Trachelyopterus galeatus</i>			
30	<i>Pterodoras granulatus</i>			
31	<i>Platydoras armatulus</i>			
32	<i>Pimelodella</i> sp.	X	X	
33	<i>Pimelodella</i> sp.1	X	X	
34	<i>Rhamdia</i> sp.	X		
35	<i>Rhamdia quelen</i>	X		
36	<i>Amaralia oviraptor</i>			X
37	<i>Corydoras aurofrenatus</i>			
38	<i>Corydoras aeneus</i>			X
39	<i>Corydoras hastatus</i>			X
40	<i>Ancistrus pirareta</i>			X
41	<i>Rineloricaria aurata</i>			
42	<i>Otocinclus</i> sp.			X
43	<i>Eigenmannia trilineata</i>			
44	<i>Brachyhypopomus gauderio</i>			
45	<i>Gymnotus pantanal</i>		X	
46	<i>Potamorhaphis eigenmanni</i>			
47	<i>Bujurquina vittata</i>			X
48	<i>Cichlasoma dimerus</i>			X
49	<i>Crenicichla lepidota</i>			
50	<i>Gymnogeophagus balzanii</i>			X
51	<i>Pseudopimelodus</i> sp.	X		
52	<i>Crenicichla mandelburgeri</i>			
53	<i>Gymnorhamphichthys britskii</i>			
54	<i>Rineloricaria lanceolata</i>			
55	<i>Loricaria</i> sp.			
56	<i>Hypostomus</i> sp.			
57	<i>Pimelodella gracilis</i>		X	
58	<i>Microglanis carlae</i>			
59	<i>Pimelodus maculatus</i>		X	
60	<i>Serrapinnus</i> sp.			
61	<i>Curimatopsis</i> sp			
62	<i>Bryconops melanurus</i>			
63	<i>Otothyropsis</i> sp.			
64	<i>Paravandellia oxyptera</i>			

Table 13 – Absolute and relative abundance of fish

Especie	Ab. Absolute	Ab. Relative
(n=1798)	-	-
<i>Odontostilbe pequirá</i>	470	26,14
<i>Corydoras aeneus</i>	153	8,50
<i>Moenkhausia dichrourea</i>	108	6,006
<i>Astyanax lineatus</i>	105	5,83
<i>Hyphessobrycon eques</i>	97	5,39
<i>Aphyocharax anisitsi</i>	74	4,11
<i>Paravandellia oxyptera</i>	70	3,89
<i>Astyanax lacustris</i>	69	3,83
<i>Poptella paraguayensis</i>	62	3,44
<i>Psellogrammus kennedyi</i>	58	3,22
<i>Bryconamericus exodon</i>	54	3,00
<i>Hemigrammus ulreyi</i>	36	2,00
<i>Moenkhausia bonita</i>	35	1,94
<i>Gymnocorymbus ternetzi</i>	26	1,44
<i>Pimelodella sp.</i>	26	1,44
<i>Moenkhausia sanctaefilomenae</i>	23	1,27
<i>Triportheus pantanensis</i>	23	1,27
<i>Cichlasoma dimerus</i>	21	1,16
<i>Steindachnerina brevipinna</i>	19	1,05
<i>Characidium sp.</i>	16	0,88
<i>Hoplias misionera</i>	16	0,88
<i>Aphyocharax rathbuni</i>	15	0,83
<i>Characidium sp.2</i>	15	0,83
<i>Crenicichla lepidota</i>	15	0,83
<i>Rhamdia quelen</i>	15	0,83
<i>Characidium sp. 1</i>	13	0,72
<i>Pyrrhulina australis</i>	13	0,72
<i>Otocinclus sp.</i>	12	0,66
<i>Platydoras armatulus</i>	12	0,66
<i>Hypostomus sp.</i>	9	0,50
<i>Curimatopsis sp</i>	8	0,44
<i>Tetragonopterus argenteus</i>	8	0,44
<i>Bujurquina vittata</i>	7	0,38
<i>Corydoras aurofrenatus</i>	7	0,38
<i>Gymnogeophagus balzanii</i>	7	0,38
<i>Ancistrus pirareta</i>	6	0,33
<i>Gymnotus pantanal</i>	6	0,33
<i>Megaleporinus obtusidens</i>	6	0,33

Especie	Ab. Absolute	Ab. Relative
<i>Pimelodella</i> sp.1	6	0,33
<i>Pimelodus maculatus</i>	6	0,33
<i>Bryconops melanurus</i>	4	0,22
<i>Otothyropsis</i> sp.	4	0,22
<i>Serrapinnus</i> sp.	4	0,22
<i>Acestrorhynchus pantaneiro</i>	3	0,16
<i>Eigenmannia trilineata</i>	3	0,16
<i>Paradon nasus</i>	3	0,16
<i>Rhamdia</i> sp.	3	0,16
<i>Rineloricaria lanceolata</i>	3	0,16
<i>Amaralia oviraptor</i>	2	0,11
<i>Brachyhypopomus gauderio</i>	2	0,11
<i>Charax leticiae</i>	2	0,11
<i>Crenicichla mandelburgeri</i>	2	0,11
<i>Microglanis carlae</i>	2	0,11
<i>Potamorhina squamoralevis</i>	2	0,11
<i>Potamorrhaphis eigenmanni</i>	2	0,11
<i>Serrasalmus marginatus</i>	2	0,11
<i>Corydoras hastatus</i>	1	0,05
<i>Gymnorhamphichthys britskii</i>	1	0,05
<i>Loricaria</i> sp.	1	0,05
<i>Pimelodella gracilis</i>	1	0,05
<i>Pseudopimelodus</i> sp.	1	0,05
<i>Pterodoras granulatus</i>	1	0,05
<i>Rineloricaria aurata</i>	1	0,05
<i>Trachelyopterus galeatus</i>	1	0,05

Table 14 – Abundance of total fish species per sampling area

N°	Especie	Gav	Tre	Sol	Lib	Sta. Ter	Zap	Her	Total
1	<i>Acestrorhynchus pantaneiro</i>	1				2			3
2	<i>Serrasalmus marginatus</i>	2							2
3	<i>Paradon nasus</i>			3					3
4	<i>Megaleporinus obtusidens</i>	5				1			6
5	<i>Steindachnerina brevipinna</i>	7	12						19
6	<i>Potamorhina squamoralevis</i>	1					1		2
7	<i>Hoplias misionera</i>	3	3		2	3	2	3	16
8	<i>Pyrrhulina australis</i>	4	4			2	3		13
9	<i>Triporthus pantanensis</i>	15	8						23
10	<i>Charax leticiae</i>		2						2
11	<i>Astyanax lacustris</i>		22	16	13	8	6	4	69
12	<i>Astyanax lineatus</i>		70		12	5	10	8	105
13	<i>Psellogrammus kennedyi</i>	12	25	8				13	58
14	<i>Hemigrammus ulreyi</i>		30			6			36
15	<i>Bryconamericus exodon</i>	20				15	6	13	54
16	<i>Moenkhausia dichroua</i>	6	10	19		32	26	15	108
17	<i>Moenkhausia bonita</i>	3	6			5	10	11	35
18	<i>Moenkhausia sanctaefilomenae</i>	5		5		5	3	5	23
19	<i>Odontostilbe pequirá</i>	226	60		41	40	80	23	470
20	<i>Gymnocorymbus ternetzi</i>	10	15			1			26
21	<i>Poptella paraguayensis</i>	13	12			12	16	9	62
22	<i>Tetragonopterus argenteus</i>	6					2		8
23	<i>Hyphessobrycon eques</i>	61	8	15		2	5	6	97
24	<i>Aphyocharax anisitsi</i>	10	12	3		23	14	12	74
25	<i>Aphyocharax rathbuni</i>	9	6						15
26	<i>Characidium sp.</i>	12		2	2				16
27	<i>Characidium sp.1</i>		4	3	4			2	13
28	<i>Characidium sp.2</i>			1			8	6	15
29	<i>Trachelyopterus galeatus</i>		1						1
30	<i>Pterodoras granulatus</i>		1						1
31	<i>Platydoras armatulus</i>		12						12
32	<i>Pimelodella sp.</i>	2	3	1		6	9	5	26
33	<i>Pimelodella sp.1</i>	3						3	6
34	<i>Rhamdia sp.</i>			3					3
35	<i>Rhamdia quelen</i>	4					2	9	15
36	<i>Amaralia oviraptor</i>	2							2
37	<i>Corydoras aurofrenatus</i>					2		5	7
38	<i>Corydoras aeneus</i>			40		68		45	153
39	<i>Corydoras hastatus</i>	1							1
40	<i>Ancistrus pirareta</i>		2		1	3			6

N°	Especie	Gav	Tre	Sol	Lib	Sta. Ter	Zap	Her	Total
41	<i>Rineloricaria aurata</i>				1				1
42	<i>Otocinclus sp.</i>				2	2	3	5	12
43	<i>Eigenmannia trilineata</i>	3							3
44	<i>Brachyhypopomus gauderio</i>	2							2
45	<i>Gymnotus pantanal</i>	5				1			6
46	<i>Potamorhaphis eigenmanni</i>	1				1			2
47	<i>Bujurquina vittata</i>	2	3				2		7
48	<i>Cichlasoma dimerus</i>		2	4		3	8	4	21
49	<i>Crenicichla lepidota</i>	5				3	2	5	15
50	<i>Gymnogeophagus balzanii</i>		6					1	7
51	<i>Pseudopimelodus sp.</i>				1				1
52	<i>Crenicichla mandelburgeri</i>							2	2
53	<i>Gymnorhamphichthys britskii</i>					1			1
54	<i>Rineloricaria lanceolata</i>							3	3
55	<i>Loricaria sp.</i>							1	1
56	<i>Hypostomus sp.</i>					3	6		9
57	<i>Pimelodella gracilis</i>							1	1
58	<i>Microglanis carlae</i>					2			2
59	<i>Pimelodus maculatus</i>						6		6
60	<i>Serrapinnus sp.</i>					1		3	4
61	<i>Curimatopsis sp.</i>						3	5	8
62	<i>Bryconops melanurus</i>					4			4
63	<i>Otothyropsis sp.</i>					2	1	1	4
64	<i>Paravandellia oxyptera</i>					29	41		70
	Total de especies por área de muestreo	461	339	123	79	293	275	228	1798

Photographs



Figure 51 – A- *Astyanax lacustris*, B- *Parodon nasus*, C- *Characidium* sp., D- *Acestrorhynchus pantaneiro*, E- *Pyrrhulina australis*, F- *Psellogrammus kennedyi*. Photo: (Jimmy Emhart, Christian Baez & Oscar Feltes)



Figure 52 – G- *Serrasalmus marginatus*, H- *Aphyocharax rathbuni*, I- *Eigenmannia trilineata*, J- *Brachyhypopomus gauderio*, K- *Gymnotus pantanal*, M- *Moenkhausia bonita*. Photo: (Jimmy Emhart, Christian Baez & Oscar Feltes)



Figure 53 – N- *Gymnocorymbus ternetzi*, O- *Crenicichla lepidota*, P- *Megaleporinus obtusidens*, Q- *Pimelodella* sp., R- *Hoplias misionera*, S- *Moenkhausia dichroua* (especie más abundante). Photo: (Jimmy Emhart, Christian Baez & Oscar Feltes)



Figure 54 – T- *Hyphessobrycon eques*, U- *Gymnogeophagus balzanii*. V- *Aphyocharax anisitsi*, W- *Platydoras armatulus*, X- *Rineloricaria aurata*, Y- *Pseudopimelodus* sp. Photo: (Jimmy Emhart, Christian Baez & Oscar Feltes)

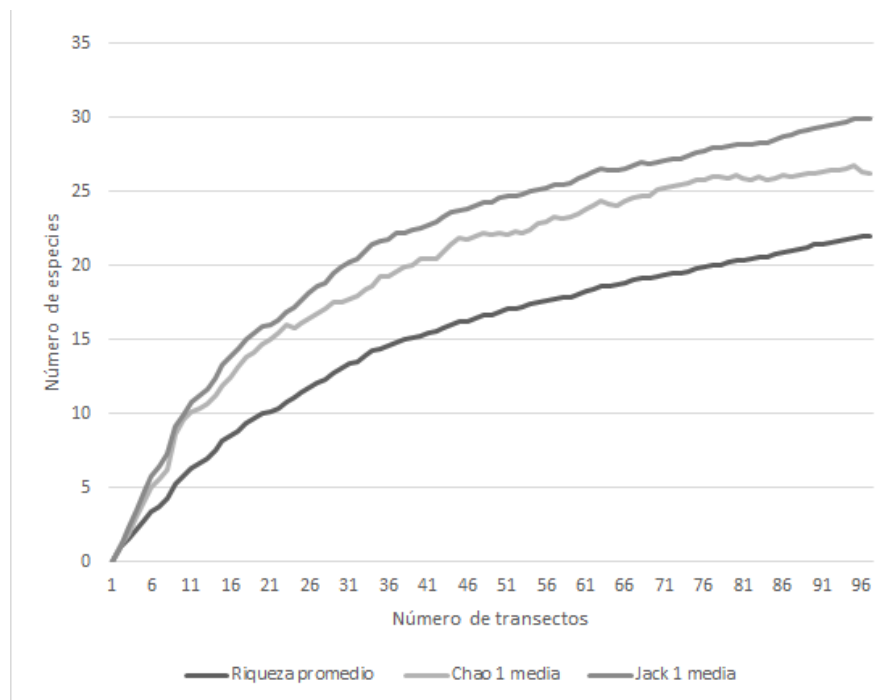


Figure 55 – Z- *Odontostilbe pequirá* (Mojarra), especie categorizada como LC (Preocupación menor por la UICN regional. Photo: (Jimmy Emhart, Christian Baez & Oscar Feltes)

Herpetological survey

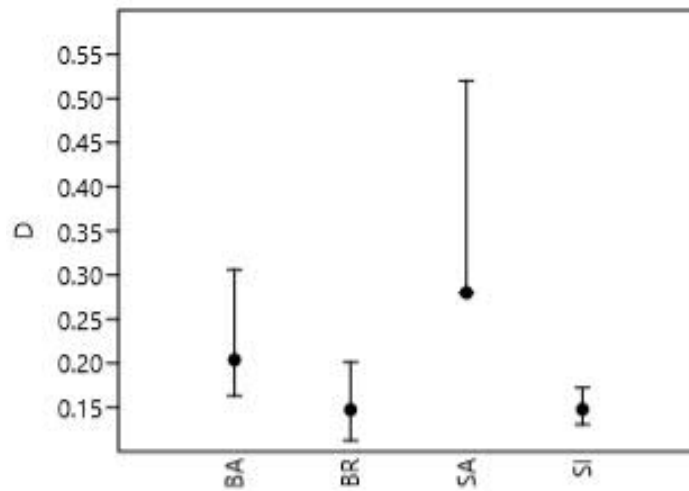
A total of 31 species (24 amphibians and 7 reptiles) were recorded along the transects, while another nine amphibians and 14 reptile species were recorded during random searches and at breeding grounds in the entire study area. This represents 61% of the amphibian species and 23% of the reptile species within the Concepción and Amambay Departments, combined (Brusquetti & Lavilla 2006, Brusquetti et al. 2007, Cacciali et al. 2016, Cacciali & Kohler 2018, Smith et al. 2012, Weiler et al. 2013). It is expected that the occurrence of at least another one amphibian species and twelve more reptile species is highly likely, based on the fact that these had already been observed during the evaluations of nearby conservation units, such as the Paso Bravo National Park (Altervida 2003), San Luis National Park (Rojas-Bonzi et al. 2020), Tagatiya Mi Nature Reserve (Concepción et al. 2004), and the Estancia Estrella Ranch (*Red Paraguaya de Conservación en Tierras Privadas*, 2008).

Figure 56 – Species accumulation curve for amphibians based on each sampling unit (transects with repetitions)



Using the data obtained in the herpetological survey where 22 species of amphibians were found, the Chao 1 and Jack 1 species richness estimators calculate that 26 species (95% confidence limits: 22.67 - 47.71 species, could be found with the same sampling effort. As the curve does not reach asymptotes in the species accumulation curves, it is suggested that with a greater sampling effort, even more species not previously registered will be found. According to the estimators, between 73.52% and 84.09% of the species likely to occur in the area were observed.

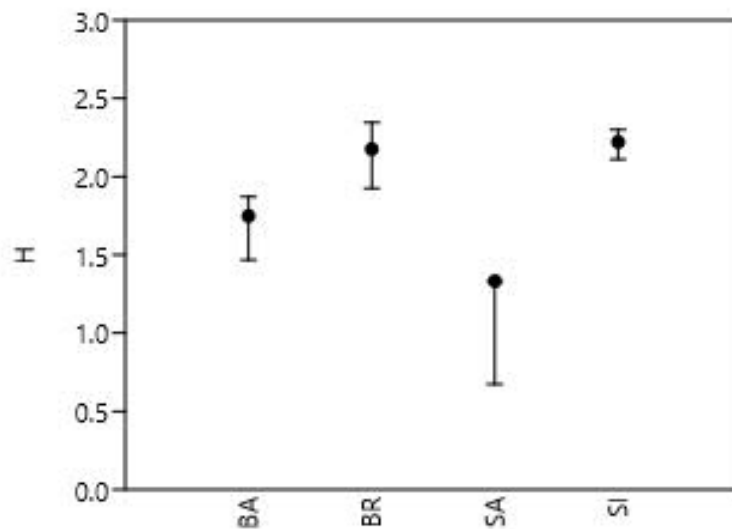
Figure 57 – Simpson Dominance



BA: Degraded High Forest; BR: Riparian Forest; SA: High Savanna; SI: Floodable Savanna.

The Simpson index representing the probability that two individuals in a population are randomly selected and belong to the same species, expresses how equitable the number of individuals of the species found is (Magurran, 1988). The closer to 1 (one) the index is, the greater the dominance of common species, and the closer to 0 (zero), the more equitable the population. In the BA, BR, SA and SI formations a mean dominance can be observed that fluctuates between 0.28 (SA) to 0.15 (BR), so that a dominance of common species and low rates of encounter of rare species.

Figure 58 –Equity Index

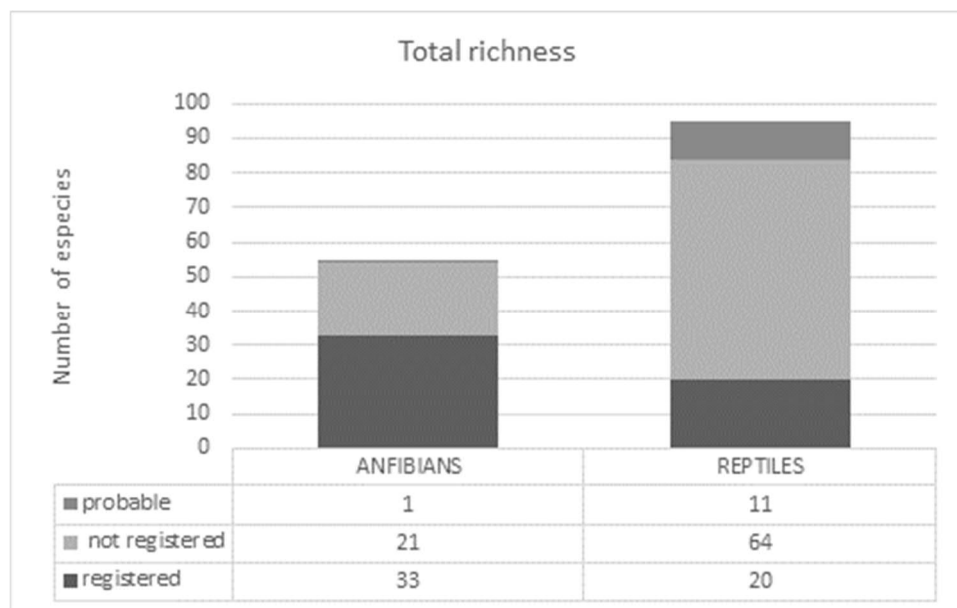


BA: Degraded High Forest; BR: Riparian Forest; SA: High Savanna; SI: Floodable Savanna.

On the other hand, the Shannon index expresses the uncertainty to predict to which species an individual found at random from a sample in the population will belong. The

index has a value of 0 (zero) when the population sample contains only one species, and has maximum values when all the species assumed to be present are equitably represented (Magurran, 1988). In this case, the index varies between 1.3 (SA) and 2.2 (SI). This complements the Simpson index, which shows little equity in the representation of species, and also a low representation of them in the SA, in particular.

Figure 59 – Number of species listed for the departments: not recorded during fieldwork, recorded during fieldwork, possibly present (recorded during REA of nearby conservation units)

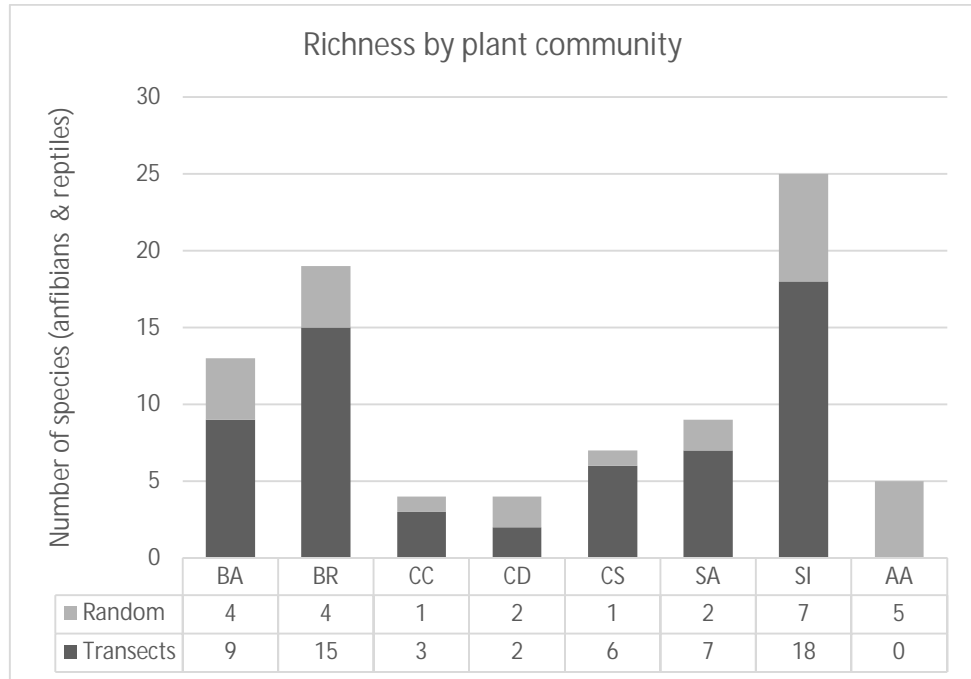


The amphibians recorded are all anurans (frogs and toads). The most numerous families in terms of species are Leptodactylidae (jumping land frogs) and Hylidae (tree frogs), both with 13 and 15 species each; followed by Bufonidae (toads) and Microhylidae (small-mouthed frogs). The most numerous genus was *Leptodactylus* (Leptodactylidae) with six species, followed by *Scinax* (Hylidae) with four species. The only family without representation that might be present is Odontophrynidae.

Reptiles, on the other hand, were represented by seven families, of which the most numerous was Dipsadidae (non-venomous snakes) with eight species, followed by lizards of the Tropicuridae family with four species. The rest were represented by only one or two species each, but from very diverse groups such as turtles, caimans, and both groups of venomous snake families: Elapidae (corals) and Viperidae (pit vipers and rattlesnakes). The most abundant group, with many individuals seen randomly throughout the entire campaign, was the Tropicuridae. *Teius teyou* was the most frequently seen species, with several individuals seen crossing paths during the main hours of activity.

The three communities with highest richness of herpetozoa were SI (25 species), BR (19 species) and BA (13 species). Amphibians contributed most of the species to these results with 22 species in SI, 14 species in BR, and 9 species in BA (see Figure 42).

Figure 60 – Figure 6–1 Number of species recorded under the various plant communities. Number of species found along transects and contribution from random surveys (by night, casual encounters)



Auditory records of 16 species using the SI as a breeding/mating ground were made based on vocalizations, which also resulted in the highest number of species vocalizing in any of the plant communities. In spite of this, surprisingly only five species of reptiles were observed at this site: two of the three most recorded lizards (*Teiurus teyuna* and *Notomabuya frenata*) and two snakes with single records (*Oxyrhopus guibei* and *Philodryas olfersii*).

BR and BA follow the SI in terms of species richness; in these formations, several species of anurans carry out vital activities such as estivation, hibernation, foraging, shelter and dispersal, as well as reproductive activities in the case of certain species (Gibbons 2003). A clear example is *Rhinella scitula*, a species that completes its cycle within the BR, breeding/mating at the edges of streams (Caramaschi & Niemeyer 2003; Maragno & Souza 2011), or the case of the males of *Leptodactylus elenae* which were recorded vocalizing from within the forest. Out of all the species found, only *Adenomera diptyx*, *Leptodactylus bufonius* and *L. labyrinthicus* were inactive and found hiding/sheltered. In the case of BR and BA, six and five species of reptiles were found, respectively. In the BR we can mention the records of *Chelonoidis carbonaria* (tortoise), a sheltered *Bothrops diporus*, and a *Micrurus frontalis* which was found being preyed upon by a *Salvator merianae*; proof of the trophic interaction between herpetozoans. Furthermore, this particular event was interesting, as this lizard has been recorded preying upon multiple reptile and amphibian species (Kasperoviczus et al. 2015), but not this particular coral.

In the SI, the most frequently encountered species was *Leptodactylus fuscus* (representing 26% of the total number of individuals observed), a very common and abundant jumping/leaping land frog found near permanent or temporary bodies of water, and even in degraded and urban habitats (Cei 1980, Souza et al. 2014). Other

common species include *Leptodactylus podicipinus* (21%), *Physalaemus albonotatus* y *Pseudopaludicola ameghini* (8% each); the latter, although difficult to observe, calls/sings/vocalizes from low levels among herbaceous plants on flooded soils and was found in great abundance throughout the area. In the BR, the two most abundant species by a wide margin were *Pseudopaludicola ameghini* (26.3%) and *Physalaemus albonotatus* (23.1%), followed by *Leptodactylus fuscus* (15%) y *Rhinella scitula* (8%). These species were observed in great abundance in the understory, particularly juveniles, though were highly elusive among the leaf litter. Similar patterns were seen in the BR of the Humid Chaco (Moreno 2017), where *P. albonotatus* and *P. boliviana* dominate the diversity of terrestrial anurans, while *S. nasicus* dominates the diversity of arboreal anurans. The encounter rates within other plant communities were too low to make any statement regarding relative abundance. Nevertheless, it is worth mentioning that four individuals of *Melanophryniscus fulvoguttatus* were observed (15%) in BA, making it the species (out of six) together with *P. albonotatus* with the highest number of encounters. Although observed in the forests, these small toads were detected calling/singing/vocalizing in tall herbaceous fields in the *Cerrado*, where temporary bodies of water form. In *Cerrado* phytophysionomies, *Teius teyou* was the most common, but with only four or fewer records for each formation.

The diversity indices were applied only to the amphibian records, since the reptile encounters were very fortuitous and from very distant taxonomic groups. Both Shannon and Simpson indices show the same pattern, where SI and BR are more diverse with respect to BA. It is also observed that the SA has insufficient records to adjust the estimates to calculate reliable estimators. This is consistent with the results described above. Of the amphibian species listed, none have any value in terms of commercial use and are therefore not listed in CITES. In terms of conservation status, only *Rhinella scitula* and *Dendropsophus elianae* are included under some degree of threat, both at international and national levels. *Rhinella scitula* is a small terrestrial toad (34 -51 mm) endemic to the *Cerrado*; in Paraguay it is found exclusively within the Departments of Amambay, Concepción and San Pedro (Brusquetti et al. 2006, Smith et al. 2012, Sugai et al. 2014). *Dendropsophus elianae* (20 - 26 mm) is an endemic climbing frog of the *Cerrado* (Napoli & Caramaschi, 2000); it has few records in the country which all come from within the Departments of Amambay and Concepción. Its restricted distribution and few records rank it as EN (endangered) at a national level (Motte et al. 2019). Of the reptile species recorded, none are included under any level of international threat category. At a national level, however, *Chelonoidis carbonaria* (red-footed tortoise) and *Caiman latirostris* (broad-nosed caiman) are threatened (MADES Res. N°206) and listed in CITES. Among the species with a high probability of occurrence, *Eunectes notaeus* (*anaconda amarilla*) and *Boa constrictor* (*boa de las vizcacheras*) are listed in CITES; the latter, together with *Norops meridionalis* (*camaleoncito*), are threatened at a national level. *Chelonoidis carbonaria* is a large land turtle, with a widespread but fragmented distribution in South America, whose southern portion covers most of the Pantanal biomes, the northern portion of the Chaco and southern portion of the *Cerrado*. The only record was made within the BR of the main course of the Trementina stream, an area almost unaffected by anthropic activities, though locals affirm that it is also seen in more modified areas.

At present, there are no legal commercial uses of reptiles in Paraguay (MADES – DGPCB 2019) though historically the local populations, immigrants and indigenous, have utilized wild species for subsistence, trade, pets, medicines and rituals (MADES –

DGPCB, 2019), including reptiles such as boas, aquatic and terrestrial turtles e.g. *Chelonidis carbonaria*, both species of caimans and tegu lizards (*Salvator*). In the 80s and 90s, there were national programs for caiman (Aquino & Scott, 2008), boas (Waller at al., 1995), and tegu lizards (Mieres & Fitzgerald, 2006) harvesting mainly focused on their hides. None of these programs are any more valid and the trade of these species is illegal.

Table 15 – List Species of amphibians and reptiles recorded

	Scientific names	Common name in Spanish	IUCN Conservati on status	Natural Community
<i>Amphibians</i>				
Anura				
Bufonidae				
1	<i>Melanophryniscus fulvoguttatus</i>	Sapito	LC	BA,CD
2	<i>Rhinella diptycha</i>	Sapo	LC	CS,PP,SI
3	<i>Rhinella scitula</i>	Sapito del Cerrado	DD	BR
Hylidae				
4	<i>Dendrosophus elianae</i>	Ranita	NE	SI
5	<i>Dendropsophus minutus</i>	Ranita trepadora chica	LC	CS, SI,AA
6	<i>Dendropsophus nanus</i>	Ranita trepadora enana	LC	BR, SA,SI,AA,CS
7	<i>Boana punctata</i>	Rana verde	LC	SI, AA
8	<i>Boana raniceps</i>	Rana arbórea	LC	SI
9	<i>Phyllomedusa sauvagii</i>	Rana mono chaqueña	LC	BA
10	<i>Pithecopus azureus</i>	Ranita mono	DD	BA
11	<i>Pseudis platensis</i>	Rana boyadora grande	DD	AA
12	<i>Scinax acuminatus</i>	Ranita hocicuda Chaqueña	LC	BR
13	<i>Scinax fuscomarginatus</i>	rana trepadora narigona	LC	CS,SI,VAA
14	<i>Scinax fuscovarius</i>	Rana trepadora común	LC	CD,SI
15	<i>Scinax nasicus</i>	Rana trepadora hocicuda	LC	BR,SI,SA
16	<i>Trachycephalus typhonius</i>	Rana lechosa	LC	PP
Leptodactylidae				
17	<i>Adenomera diptyx</i>	Ranita marmolada	LC	BR
18	<i>Leptodactylus bufonius</i>	Rana hornera	LC	AA
19	<i>Leptodactylus elenae</i>	Rana marmolada de labio blanco	LC	BR
20	<i>Leptodactylus fuscus</i>	Rana silbadora	LC	BA,BR,SA, SI
21	<i>Leptodactylus labyrinthicus</i>	Sapo toro laberintico	LC	BA
22	<i>Leptodactylus macrosternum</i>	Rana Chaqueña	LC	SI,BR
23	<i>Leptodactylus podicipinus</i>	Rana de vientre moteado	LC	AR,BR,CD,SA,SI, VA
24	<i>Physalaemus albonotatus</i>	Ranita maulladora	LC	BA,BR,SI,SA,AR
25	<i>Physalaemus biligonigerus</i>	Ranita llorona, ranita de cuatro ojos	LC	BA,BR,SI

	Scientific names	Common name in Spanish	IUCN Conservati on status	Natural Community
26	<i>Physalaemus cuvieri</i>	Ranita Ladradora	LC	SI
27	<i>Physalaemus nattereri</i>	Rana cuatro ojos	LC	CS,SI,BR
28	<i>Pseudopaludicola ameghini</i>	Ranita	LC	AR,SI,BR
29	<i>Pseudopaludicola</i> cf. Motorzihno	Ranita		BR
Microhylidae				
30	<i>Chiasmocleis albopunctata</i>	Ranita	LC	SI,BA
31	<i>Dermatonotus muelleri</i>	Rana de cabeza chica, Tapa	LC	BA
32	<i>Elachistocleis matogrosso</i>	Ranita aceituna o panza amarilla	LC	SI
REPTILES				
Testudines				
Testudinidae				
33	<i>Chelonoidis carbonaria</i>	Tortuga de patas rojas	NE	BR
Crocodylia				
Alligatoridae				
34	<i>Caiman yacare</i>	Yacaré	LC	AA
35	<i>Caiman latirostris</i>	Yacaré Overo	LC	AA,SI
Squamata-Sauria				
Tropiduridae				
36	<i>Ameiva ameiva</i>	Lagarto verde	LC	CD
37	<i>Ameivula</i> aff. <i>ocellifera</i>	Spix's Whiptail		SI
38	<i>Salvator merianae</i>	lagarto overo	LC	BA,BR,CD
39	<i>Teius teyou</i>	Lagartija verde	LC	BA,BR,CC,CD,SI, SA
40	<i>Tropidurus lagunablanca</i>	Llagarto espinoso de Lagunablanca	NE	BA
Mabuyidae				
41	<i>Manciola guaporicola</i>	Lagartija de cristal	LC	BA
42	<i>Notomabuya frenata</i>	Lagartija de cristal	LC	BR,CC,SA,SI
Squamata-Serpientes				
Viperidae				
43	<i>Bothrops diporus</i>	Yarará Chica	LC	BR
44	<i>Bothrops matogrossensis</i>	Yarará	NE	CS,SA
Elapidae				
45	<i>Micrurus frontalis</i>	Serpiente de coral	LC	BR
Dipsadidae				
46	<i>Erythrolamprus miliaris</i>	Mboi pe	LC	BR
47	<i>Erythrolamprus poecilogyrus</i>	Ñandurire	LC	SA
48	<i>Helicops leopardinus</i>	Culebra de agua	LC	VA

	Scientific names	Common name in Spanish	IUCN Conservation status	Natural Community
49	<i>Lygophis dilepis</i>	Culebra listada	LC	BA
50	<i>Oxyrhopus guibei</i>	Falsa coral	LC	SI
51	<i>Philodryas olfersii</i>	Culebra verde de Olfers	LC	SI
52	<i>Sibynomorphus ventrimaculatus</i>	Culebra duerme duerme	LC	CD
53	<i>Thamnodynastes hypoconia</i>	Falsa yarara	LC	SI

The following are the photographic records of the amphibian and reptile species



Figure 61 – A- *Boana raniceps*, B- *Dendropsophus nanus*, C- *Scinax fuscomarginatus*, D- *S. nasicus*, E- *Pithecopus azureus*, F- *Phyllomedusa sauvagii*.

Photos: (Diego Bueno & Yolanda Ramos).



Figure 62 – G- *Pseudis platensis* H- *Leptodactylus podicipinus*, I- *L. elenae*, J- *L. chaquensis*, K- *L. fuscus*, L. *Puesta de L. Podicipinus*
 Photos: (Diego Bueno & Yolanda Ramos).



Figure 63 – M- *Physalaemus nattereri* N- *P. nattereri* vocalizando, O- *P. albonotatus*, P- puesta de *P. albonotatus*, Q- *Pseudopaludicola ameghini*, R- *Pseudopaludicola ameghini* vocalizando.

Photos: (Diego Bueno & Yolanda Ramos).



Figure 64 – S- *Melanophryniscus fulvogutattus* T- *Rhinella scitula*, U- *R. diptycha*, V- *Dermatonotus*.

Photos: (Diego Bueno & Yolanda Ramos).

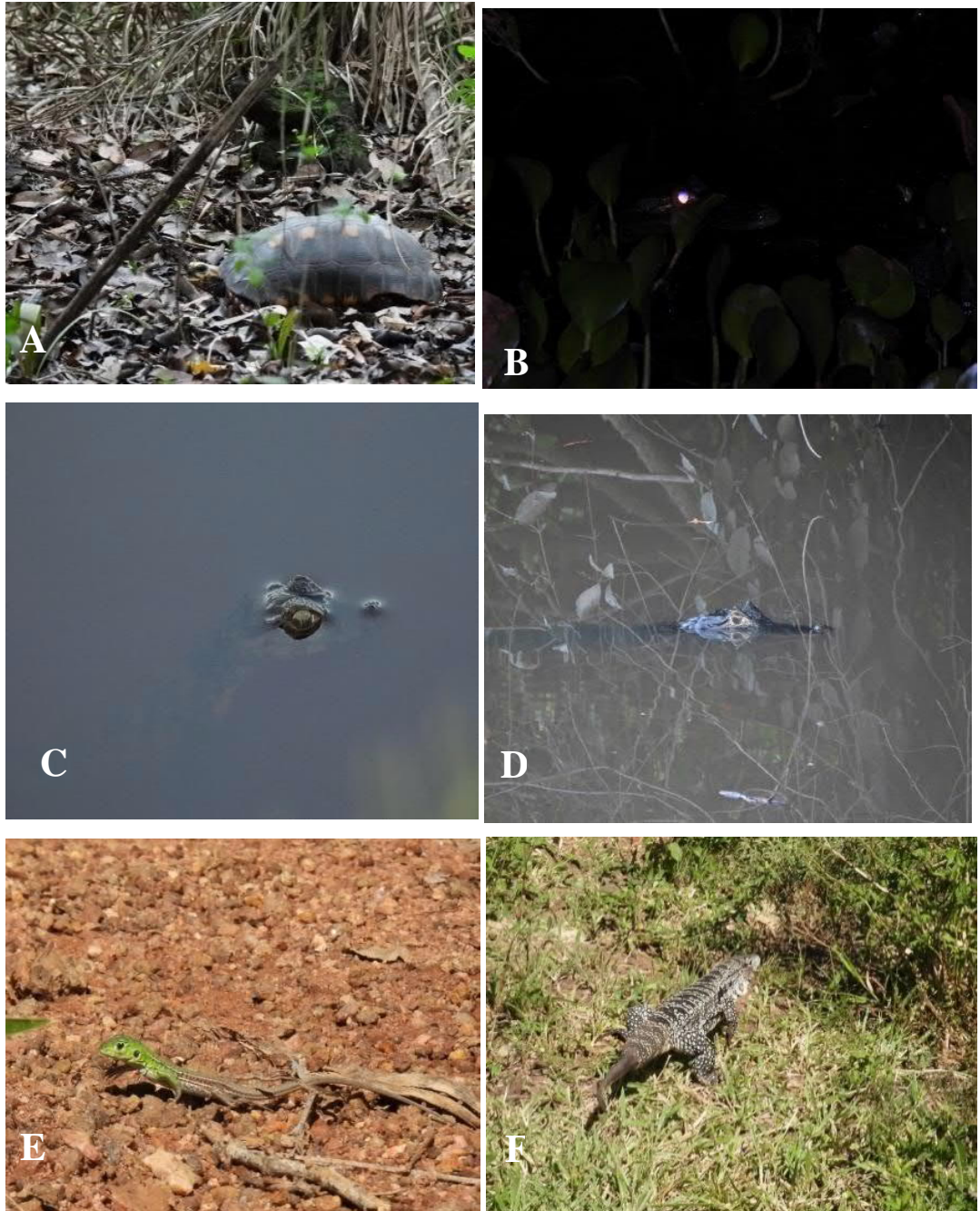


Figure 65 – A- *Chelonoidis carbonaria* B- *Caiman latirostris*, C *yacare juvenil*, D- *C. yacare*, E-F *Teius teyou*, F. *Salvator merianae*.

Photos: (Diego Bueno & Yolanda Ramos).

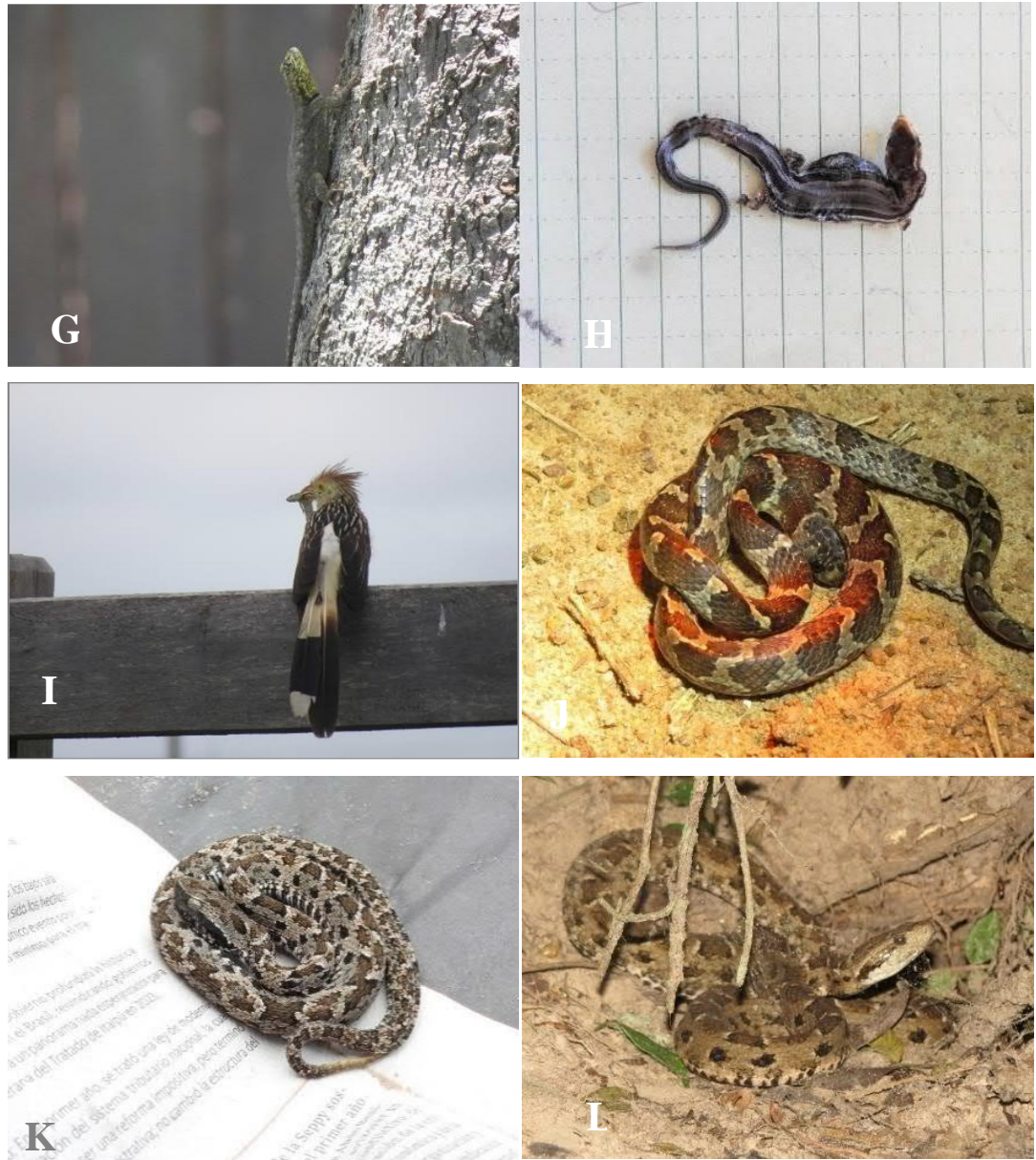


Figure 66 – G- *Tropidurus lagunablanca*, H- *Manciola guaporicola*, I- *Notomabuya frenata* (en la boca del *Guyra guyra*), J- *Sibynomorphus ventrimaculatus*, K- *Bothrops matogrossensis*, L- *Bothrops diporus*.

Photos: (Diego Bueno & Yolanda Ramos).

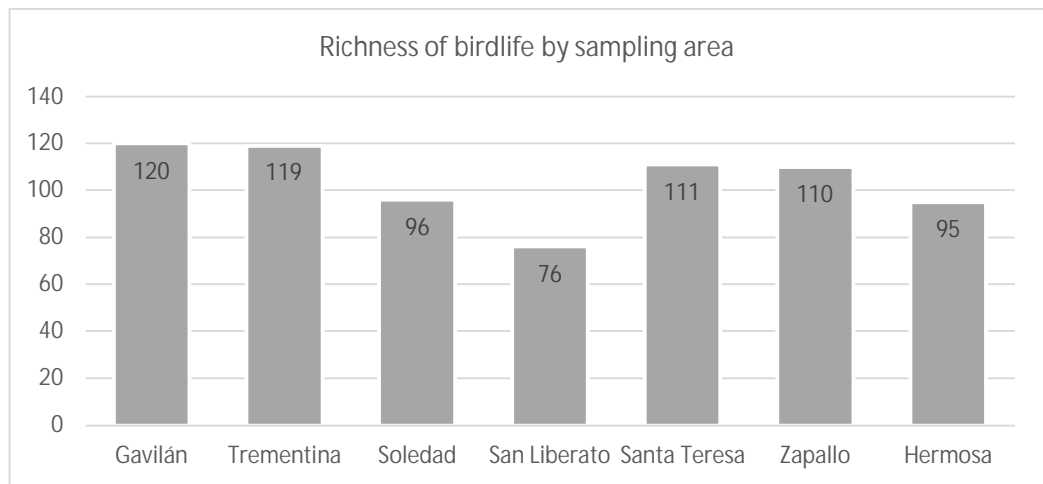


Figure 67 – Reptiles: M- *Erythrolamprus miliaris*, N- *Erythrolamprus poecilogyrus*, O- *Thamnodynastes hypoconia*, Q- *Búsqueda activa de anfibios y reptiles* R- *Uso de refugios por reptiles*.

Ornithological survey

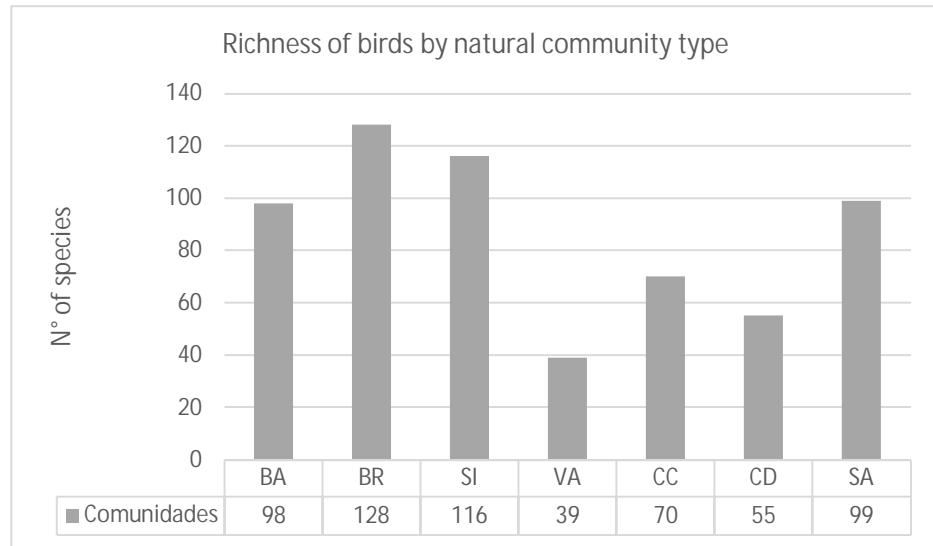
A total of 223 species of birds were recorded, belonging to 25 orders and 50 taxonomic families, including the Tyrannidae (13%), Thraupidae (11%) and Psittacidae (6%) families with most species recorded. Among the sampling areas Gavilán and Trementina presented highest number of species recorded during fieldwork (54% and 53%, respectively), while in Santa Teresa (50%) and Zapallo (49%) and San Liberato were the sites with the less recorded species (34%). The difference in number of species recorded between the highest and lowest sampling areas was due to the fact that the travel to and from the other sampling areas was made from Gavilán, thus creating a greater opportunity to record occasional species, and this impacted on the total richness of these sites in particular.

Figure 68 – Richness of birdlife by sampling area



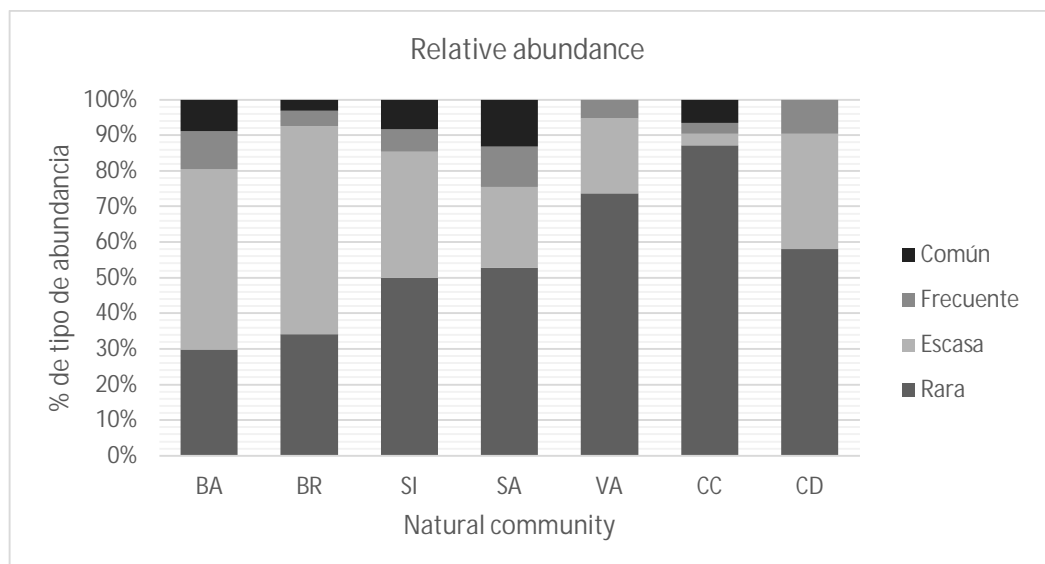
The natural community with the highest number of species was the BR (57%), bearing in mind it was the site with the highest number of lists among all the others and the one surveyed in all properties; followed by SI (52%), SA (44%) and BA (44.6%) with 52, 99 and 98 species recorded in each, respectively. The phytophysionomies of the *Cerrado*, *Campo Cerrado* (CC) and *Cerradón* (CD) were the sites with the lowest number of recorded species and were only identified in one property. The latter could be due to the fact that not all sites had typical plant formations of the *Cerrado* in a good state of conservation, and some of them were subject to fires during the monitoring, and were grazed by livestock. In the natural communities of the BR, CC and SI, species under one or another category of national and international threat were found. Meanwhile, the species with migratory patterns were recorded, for the most part, in the BR (50%) and SI (30%) formations; the remaining 20% were distributed among the other communities.

Figure 69 – Richness of birds by natural community type



With regard to the relative abundance evaluated within the 192 lists in all natural communities, a total of 3.180 individuals were recorded, with BR being the community with the most individuals counted (38%), followed by BA with 21%, SI (12%) and SA (10%). Meanwhile, the formations with the lowest number of individuals were VA (5%), CC (8%) and CD (6%), respectively, which could be due to the fact that they have fewer lists compared to the other sites. In all the communities, the relative abundance of the species was considered rare, because they were only detected once during all the patrols. The other large part was scarce with more than two records, and to a lesser extent frequent and common (between three and nine records), with BA, SA and CD being the sites with the most frequent species. Meanwhile, the SI was the site with the most common species (between 4 and 17 records), due to being detected on several occasions.

Figure 70 – Relative abundance of the recorded bird species



Six species were recorded that fall under categories of threat at an international level (NT and VU), while six species were recorded that fall under categories of threat at a national level (Threatened and Endangered) (MADES Resolution No. 254/19, Rojas et al. 2020, IUCN 2021). There were several records of a single endemic species to the Cerrado, *Saltatricula atricollis* (*pepitero de corbata*), at CC and SA in all sampling sites. In spite of being considered an endemic, this species is expanding to the south due to the savannization of landscapes in the eastern region of the country (see ornithological annex). Also, the record of *Alipiopsitta xanthops* (loro cara amarilla) another endemic species, recently documented for the country and with few records (Alvarez et al. 2012), are among the eleven species endemic to the Cerrado which occur in Paraguay according to Silva (1997).

Thirty-nine species (17%) of the birds recorded are included in the CITES Appendices. All species of Psittacidae Family are included in Appendix II together with some species of Accipitridae and Thraupidae. Two species (*Pteroglossus castanotis* and *Sarcoramphus papa*) are included in Appendix III and *Jabiru mycteria* in Appendix I. This report includes the 59% of the psittacid species of Paraguay. This region is habitat for most of the parrot species of the country, one of the bird families with most pressure regarding illegal capture and trafficking for the pet trade, resulting in drastically reduced populations. It is for this reason that this information should be considered relevant when implementing protection and conservation strategies within the project area. Among the species of importance for conservation, *Alipiopsitta xanthops*, an endemic to the Cerrado and threatened with extinction at the local level and NT at global level; *Ara chloropterus*, one of the three species of Macaw that occur within our country, though this species is not threatened globally, it is considered Endangered at a national level (MADES Res. 254/19). This species is frequently observed and there are indications that it could be nesting within the area it was recorded, according to interviews carried out with the local population.

Information was gathered regarding *Anodorhynchus hyacinthinus* and *Ara ararauna*, two of the three species of macaw that occur in Paraguay. Both are considered Endangered at a national level; however, at an international level, the first species is ranked as Vulnerable (VU) while the latter species ranks under the category of Least Concern, according to the IUCN (2020). According to key informants, individuals of this species enter from Brazil to feed and descend towards the Serranía San Luis, which coincides with the frequent records from ranches near the northern edge of the Serranía San Luis National Park (Levatich & Padilla 2019, Rojas-Bonzi et al. 2020). The species was recorded nesting in some of the properties surrounding the park (Ea. Arrecife, Ea. Garay Kue as well as in San Luis de la Sierra (Rodríguez et al. 2019).

Species that have both, seasonal as well as regional migratory movements, were recorded and four states of occurrence were identified. Of the 192 species, 89% are BR, 8% are BN, 2% are BS and only *Tringa solitaria* is NM. Only one IB species (*Passer domesticus*) was recorded.

Table 16 – State of occurrence of the birds recorded in the area

State of occurrence		
BR	Breeding Resident	Permanent breeding resident
BN	Breeding Migrant to the North	Species that breeds in Paraguay, but is less abundant or absent during winter
BS	Breeding Migrant to the South	Species that breeds in Paraguay, but is more abundant or absent during winter
NM	Nearctic Migrant	Nests in North America during the northern summer and then migrates south during the southern spring and fall.
IB	Introduced	Introduced permanent breeding resident.

Source: Adapted from Guyra Paraguay (2004).

Another noteworthy species was *Pipile cumanensis*, which according to del Hoyo et al. (2019), has a distribution that ranges across the south of Venezuela, Guyana, northwestern Brazil and into the Amazon region of Colombia, Peru and Ecuador, thus leaving the subspecies *Pipile cumanensis grayi* as a species that occurs in Paraguay. In this sense, the IUCN follows the same nomenclature for its Red List but the change has not yet been accepted by the South American Classification Committee (SACC, Remsen et al. 2020). Consequently, it continues to remain as *P. cumanensis* for the country, but maintains the threat category assigned by the IUCN for *P. grayi*. It is also threatened with extinction (AE) at a national level. Records of this species in the country are distributed within the northeast of the Western region and in the departments of Amambay and Concepción. The other species of this family was *Crax fasciolata*, which is locally threatened with extinction (AE) and vulnerable (VU) at an international level. These species of the Cracidae family are more associated with BR, but can also occur in several forest communities of the *Cerrado* (BC) (MADES Resolution N°254/19, Rojas-Bonzi et al. 2020, IUCN 2021).

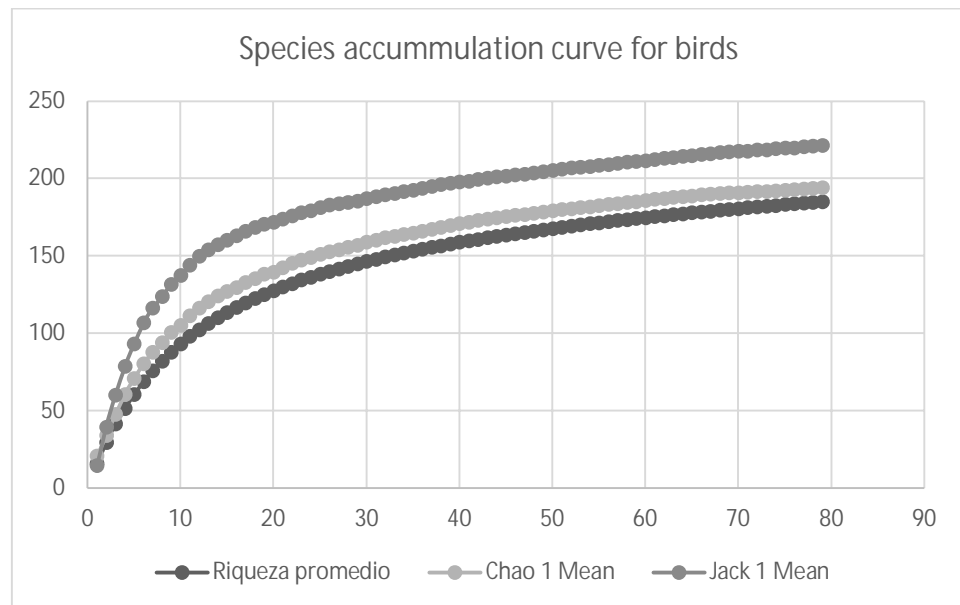
Among the birds registered during the first sampling campaign, the species indicated as "hunting for self-consumption" that were found in the forest formations (*Crax fasciolata*, *Pipile cumanensis*, *Crypturellus* spp. and *Patagioenas picazuro*) are listed. Meanwhile, in grassland environments tinamous (*Rhynchotus rufescens* and *Nothura maculosa*) are listed, and in natural aquatic communities, mainly ducks (*Cairina moschata*, *Dendrocygna viduata* and *Amazonetta brasiliensis*). According to the interviews carried out with the local inhabitants, their reports coincide with Morales and Zarza (2007), where they mention that subsistence hunting is widely extended in Paraguayan territory. Meanwhile, the parrots (parrots, macaws and parrots) are the main family affected by the illegal trafficking and trade of wildlife destined for pets in Paraguay (Mendoza et al. 2015). Morales and Zarza (2007) mention that there are other uses of birdlife due to their "medicinal or ornamental properties, but whose practice is exclusively limited to indigenous groups associated with forests. Among the species known for these uses were recorded, in this survey campaign: *Rhea americana* and birds of the families Tinamidae, Columbidae, Cathartidae, Corvidae and Turdidae.

Based on the sampling effort carried out in 18 days in the field that resulted in the registration of 223 species of birds, through 72 transects of 150 m, added the occasional

species, totaling the survey in 192 lists generated in the transects during the morning and the afternoon in the different natural communities, the accumulation curve indicates that the effort is representative, since the curve tends to be asymptotic. This indicates that the number of new species that could be registered in the area is decreasing, or, in other words, a large part of the species present in the selected sampling sites were registered.

The Chao 1 estimator indicates that nine more species could be added to the 185 recorded in the transects established in the different plant communities. On the other hand, the Jack 1 estimator indicates 221 expected species as the maximum number (Collwell 2009). This last number almost coincides with the total number of species recorded inside and outside the transects in all the sampling units evaluated during the first sampling campaign (223 species).

Figure 71 – Species accumulation curve for birds recorded in the field campaign in Parcel Properti



The Simpson index value was 0.984 (maximum value 1), which indicates a high probability that two individuals of different species are registered, therefore the sites sampled during campaign 1 present a high diversity, taking into account the sampling effort made.

The value of the Shannon-Wiener index obtained was 4.6, being the maximum value estimated for the sampling data of 5.2, which indicates that the species were uniformly represented, considering all the sampled species, which could indicate that the diversity of birds is high in the sites sampled during campaign 1.

Table 17 – List of species recorded

N°	Scientific names	Common name in Spanish	IUCN conservation status	Natural community
AVES				
Rheiformes				
Rheidae				
1	<i>Rhea americana</i>	Ñandu	NT	SI SA CC
Tinamiformes				
Tinamidae				
2	<i>Crypturellus undulatus</i>	Tataupá listado	LC	BA BR SI VA CD
3	<i>Crypturellus parvirostris</i>	Tataupá chico	LC	BA BR SI SA VA
4	<i>Crypturellus tataupa</i>	Tataupá común	LC	BR SI VA CC CD
5	<i>Rhynchotus rufescens</i>	Martineta	LC	BA BR VA CC
6	<i>Nothura maculosa</i>	Perdiz chica	LC	BR SI SA
Anseriformes				
Anhimidae				
7	<i>Chauna torquata</i>	Chajá	LC	SI VA
Anatidae				
8	<i>Dendrocygna viduata</i>	Pato silbón cara blanca	LC	SI VA
9	<i>Cairina moschata</i>	Bragado	LC	SI VA
10	<i>Amazonetta brasiliensis</i>	Alita azul	LC	SI SA VA
Galliformes				
Cracidae				
11	<i>Ortalis canicollis</i>	Charata	LC	BA BR SA
12	<i>Pipile cumanensis grayi</i>	Pava campanilla	NT	BA SI CD
13	<i>Crax fasciolata</i>	Pava pintada	VU	BR
Podicipediformes				
Podicipedidae				
14	<i>Tachybaptus dominicus</i>	Macacito gris	LC	VA
Columbiformes				
Columbidae				
15	<i>Patagioenas cayennensis</i>	Paloma colorada	LC	BA BR SI SA VA CD
16	<i>Patagioenas picazuro</i>	Paloma turca	LC	BA BR SI SA CC CD
17	<i>Columbina talpacoti</i>	Tortolita colorada	LC	BA BR SI SA VA CC CD
18	<i>Columbina squammata</i>	Palomita escamada	LC	BA BR SI SA CC
19	<i>Columbina picui</i>	Tortolita picuí	LC	BA BR SI SA
20	<i>Leptotila verreauxi</i>	Yerutí común	LC	BA BR SI SA CC CD
21	<i>Zenaida auriculata</i>	Torcaza	LC	BA BR SI SA CC
Cuculiformes				
Cuculidae				
22	<i>Guira guira</i>	Piririta	LC	BA BR SI SA CC
23	<i>Crotophaga major</i>	Anó grande	LC	BA BR
24	<i>Crotophaga ani</i>	Anó chico	LC	BA BR SI SA VA CC CD
25	<i>Tapera naevia</i>	Chochí	LC	BR SI
26	<i>Piaya cayana</i>	Tingazú	LC	CC
Nyctibiiformes				
Nyctibiidae				
27	<i>Nyctibius griseus</i>	Urutaú común	LC	BA
Caprimulgiformes				
Caprimulgidae				
28	<i>Chordeiles nacunda</i>	Ñacundá	LC	SI SA
29	<i>Lurocalis semitorquatus</i>	Añapero castaño	LC	BA
30	<i>Nyctidromus albicollis</i>	Curiango	LC	BA
31	<i>Setopagis parvula</i>	Atajacaminos chico	LC	BA
32	<i>Antrostomus rufus</i>	Atajacaminos colorado	LC	BA
Apodiformes				
Apodidae				
33	<i>Chaetura meridionalis</i>	Vencejo de tormenta	LC	CD
Trochilidae				
34	<i>Polytmus guainumbi</i>	Picaflor de antifaz	LC	CC CD
35	<i>Anthracothorax nigricollis</i>	Picaflor vientre negro	LC	BR SI

N°	Scientific names	Common name in Spanish	IUCN conservation status	Natural community
36	<i>Chlorostilbon lucidus</i>	Picaflor verde	LC	BA SI SA
37	<i>Hylocharis chrysurus</i>	Picaflor bronceado	LC	BR SI CC CD
38	<i>Eupetionema macroura</i>	Picaflor tijereta	LC	BR
Gruiformes				
Aramidae				
39	<i>Aramus guarauna</i>	Carau	LC	BR
Rallidae				
40	<i>Mustelirallus albicollis</i>	Burrito grande	LC	SI VA
41	<i>Aramides ypecaha</i>	Gallineta de agua	LC	VA
42	<i>Aramides cajaneus</i>	Chiricoe	LC	BR
43	<i>Gallinula galeata</i>	Polla negra	LC	BR SA
44	<i>Porphyrio flavirostris</i>	Polla celeste	LC	SI
45	<i>Porphyrio martinica</i>	Polla azul	LC	VA
Charadriiformes				
Charadriidae				
46	<i>Himantopus mexicanus</i>	Tero real	LC	VA
47	<i>Vanellus chilensis</i>	Tero tero	LC	BR SI SA VA
Scolopacidae				
48	<i>Tringa solitaria</i>	Pitotoi solitario	LC	SI
Jacanidae				
49	<i>Jacana jacana</i>	Jacana	LC	BR SI SA VA
Rynchopidae				
50	<i>Rynchops niger</i>	Rayador	LC	VA
Ciconiiformes				
Ciconiidae				
51	<i>Jabiru mycteria</i>	Yabirú	LC	SI SA
52	<i>Ciconia maguari</i>	Cigüeña americana	LC	SI VA
53	<i>Mycteria americana</i>	Tuyuyú	LC	SI VA
Suliformes				
Anhingidae				
54	<i>Anhinga anhinga</i>	Aninga	LC	BR VA
Pelecaniformes				
Ardeidae				
55	<i>Tigrisoma lineatum</i>	Hocó colorado	LC	VA
56	<i>Ardea cocoi</i>	Garza mora	LC	VA
57	<i>Ardea alba</i>	Garza blanca	LC	BR SA VA
58	<i>Egretta thula</i>	Garcita blanca	LC	VA
59	<i>Bubulcus ibis</i>	Garcita bueyera	LC	SA
60	<i>Butorides striata</i>	Garcita azulada	LC	BR SA VA
61	<i>Syrigma sibilatrix</i>	Flauta del sol	LC	SI SA VA
62	<i>Nycticorax nycticorax</i>	Garza bruja	LC	SI SA VA
Threskiornithidae				
63	<i>Phimosus infuscatus</i>	Cuervillo cara pelada	LC	BR SI VA
64	<i>Theristicus caerulescens</i>	Bandurria mora	LC	SI VA
65	<i>Theristicus caudatus</i>	Bandurria baya	LC	BR SI CD
66	<i>Platalea ajaja</i>	Espátula rosada	LC	SI VA
Cathartiformes				
Cathartidae				
67	<i>Sarcoramphus papa</i>	Cuervo real	LC	BA BR
68	<i>Coragyps atratus</i>	Cuervo negro	LC	BA BR SI SA CC
69	<i>Cathartes aura</i>	Cuervo cabeza roja	LC	BA BR SI SA VA
70	<i>Cathartes burrovianus</i>	Cuervo cabeza amarilla	LC	SI SA CC
Accipitriformes				
Accipitridae				
71	<i>Leptodon cayanensis</i>	Milano cabeza gris	LC	BA SI
72	<i>Rostrhamus sociabilis</i>	Caracolero	LC	SA
73	<i>Ictinia plumbea</i>	Milano plumizo	LC	BA BR SI
74	<i>Geranospiza caerulescens</i>	Gavilán patas largas	LC	BA BR
75	<i>Buteogallus meridionalis</i>	Aguilucho colorado	LC	BR SI SA

N°	Scientific names	Common name in Spanish	IUCN conservation status	Natural community
76	<i>Buteogallus urubitinga</i>	Águila negra	LC	BR
77	<i>Rupornis magnirostris</i>	Taguató común	LC	BA BR SI SA VA CD
Strigiformes				
Strigidae				
78	<i>Megascops choliba</i>	Lechucita común	LC	BA
79	<i>Glaucidium brasilianum</i>	Caburé	LC	BR
80	<i>Athene cunicularia</i>	Lechucita vizcachera	LC	BA SI SA
81	<i>Asio flammeus</i>	Lechuzón de campo	LC	SA
Trogoniformes				
Trogonidae				
82	<i>Trogon curucui</i>	Surucuá aurora	LC	BA BR SI VA CD
Coraciiformes				
Momotidae				
83	<i>Momotus momota</i>	Burgo	LC	BA BR
Alcedinidae				
84	<i>Megasceryle torquata</i>	Martín pescador grande	LC	BA BR
85	<i>Chloroceryle amazona</i>	Martín pescador mediano	LC	BR
Galbuliformes				
Bucconidae				
86	<i>Nystalus chacuru</i>	Chacurú cara negra	LC	BA SI SA VA CC
87	<i>Nystalus maculatus</i>	Durmilí	LC	BA BR SI VA CC CD
Piciformes				
Ramphastidae				
88	<i>Pteroglossus castanotis</i>	Arasarí fajado	LC	BA BR CD
89	<i>Ramphastos toco</i>	Tucán grande	LC	BA BR SI SA CD
Picidae				
90	<i>Picumnus cirratus</i>	Carpinterito común	LC	BA BR SI SA
91	<i>Melanerpes candidus</i>	Carpintero blanco	LC	BA BR SI SA
92	<i>Dryobates passerinus</i>	Carpinterito oliváceo	LC	BA SI SA
93	<i>Campephilus melanoleucos</i>	Carpintero garganta negra	LC	BA
94	<i>Dryocopus lineatus</i>	Carpintero garganta estriada	LC	BA CC CD
95	<i>Celeus lugubris</i>	Carpintero copete pajizo	LC	BR
96	<i>Piculus chrysochloros</i>	Carpintero dorado	LC	BR
97	<i>Colaptes melanochloros</i>	Carpintero real	LC	BA SI SA CC
98	<i>Colaptes campestris</i>	Carpintero campestre	LC	BR SI SA CC
Cariamiformes				
Cariamidae				
99	<i>Cariama cristata</i>	Sarí patas rojas	LC	BR SI SA CC CD
Falconiformes				
Falconidae				
100	<i>Micrastur semitorquatus</i>	Halcón montés	LC	BA
101	<i>Caracara plancus</i>	Carancho	LC	BA BR SI SA CC
102	<i>Milvago chimachima</i>	Chimachima	LC	SA CC
103	<i>Herpethotes cachinnans</i>	Guaicurú	LC	SA
104	<i>Falco femoralis</i>	Halcón plomizo	LC	SA
105	<i>Falco sparverius</i>	Halconcito colorado	LC	BR SI SA VA CC
Psittaciformes				
Psittacidae				
106	<i>Myiopsitta monachus</i>	Cotorrita	LC	BA BR SI SA
107	<i>Brotogeris chiriri</i>	Catita chiriri	LC	BA BR SI SA CC CD
108	<i>Pionus maximiliani</i>	Loro choclero	LC	BA SI CC CD
109	<i>Alipiopsitta xanthops</i>	Loro cara amarilla	NT	SA
110	<i>Amazona aestiva</i>	Loro hablador	NT	BA BR SI SA CC CD
111	<i>Amazona amazonica</i>	Loro de ala naranja	LC	SA CC
112	<i>Forpus xanthopterygius</i>	Catita viuda	LC	BA SI SA CC

N°	Scientific names	Common name in Spanish	IUCN conservation status	Natural community
113	<i>Pyrrhura devillei</i>	Chiripepé ala anaranjada	NT	BA BR SI SA
114	<i>Pyrrhura frontalis</i>	Chiripepé cabeza verde	LC	BA BR SI SA CD
115	<i>Eupsittula aurea</i>	Maracaná frente naranja	LC	BR SI SA CC CD
116	<i>Aratinga nenday</i>	Ñanday	LC	SA CC
117	<i>Ara chloropterus</i>	Guacamayo rojo	LC	BR
118	<i>Psittacara leucophthalmus</i>	Maracaná ala roja	LC	BA BR SI SA VA CC CD
Passeriformes				
Thamnophilidae				
119	<i>Taraba major</i>	Chororó	LC	BA BR SA VA CC
120	<i>Thamnophilus doliatus</i>	Batará rayado	LC	BA BR SI SA CC
121	<i>Thamnophilus caerulescens</i>	Batará plumizo	LC	BA BR SI SA CC CD
122	<i>Formicivora rufa</i>	Batará colorado	LC	SA CC
Furnariidae				
123	<i>Sittasomus griseicapillus</i>	Guirí	LC	BR
124	<i>Dendrocolaptes platyrostris</i>	Trepador oscuro	LC	BR CC CD
125	<i>Xiphocolaptes major</i>	Trepador gigante	LC	BR
126	<i>Lepidocolaptes angustirostris</i>	Chinchero chico	LC	BA BR SI SA VA CC CD
127	<i>Furnarius rufus</i>	Hornero	LC	BA BR SI SA CC CD
128	<i>Phacellodomus rufifrons</i>	Espinero frente rojiza	LC	BA BR SI SA CC
129	<i>Phacellodomus ruber</i>	Espinero grande	LC	SI SA
130	<i>Anumbius annumbi</i>	Leñatero	LC	SA
131	<i>Certhiaxis cinnamomeus</i>	Curutié colorado	LC	BR SI SA
132	<i>Schoeniophylax phryganophilus</i>	Chotoy	LC	BR SI SA CC
133	<i>Synallaxis frontalis</i>	Pijuí frente gris	LC	BR
Tityridae				
134	<i>Tityra inquisitor</i>	Tueré chico	LC	BA
135	<i>Tityra cayana</i>	Tueré grande	LC	BA BR
136	<i>Pachyramphus validus</i>	Anambé grande	LC	BR
Tyrannidae				
137	<i>Leptopogon amaurocephalus</i>	Mosqueta corona parda	LC	BA BR VA
138	<i>Hemitriccus margaritaceiventer</i>	Mosqueta ojo dorado	LC	BA BR SI SA CC CD
139	<i>Cnemotriccus fuscatus</i>	Mosqueta ceja blanca	LC	BR
140	<i>Tolmomyias sulphurescens</i>	Picochato grande	LC	BR CD
141	<i>Camptostoma obsoletum</i>	Piojito silbón	LC	BA BR SI SA CC
142	<i>Myiopagis viridicata</i>	Fiofío corona dorada	LC	BA BR
143	<i>Elaenia flavogaster</i>	Fiofío copetón	LC	BA BR SI SA VA CC CD
144	<i>Elaenia spectabilis</i>	Fiofío grande	LC	SI SA CC CD
145	<i>Lathrotriccus euleri</i>	Mosqueta parda	LC	BA
146	<i>Pyrocephalus rubinus</i>	Churrinche	LC	SA
147	<i>Xolmis cinereus</i>	Monjita gris	LC	SI SA CD
148	<i>Xolmis velatus</i>	Monjita velada	LC	BA SI SA VA CD
149	<i>Xolmis irupero</i>	Monjita blanca	LC	BR SA
150	<i>Gubernetes yetapa</i>	Yetapá grande	LC	BA SI
151	<i>Casiornis rufus</i>	Suiriri castaño	LC	BA BR SI
152	<i>Myiarchus tyrannulus</i>	Burlisto cola castaño	LC	BA BR SI SA CC
153	<i>Myiarchus swainsoni</i>	Burlisto pico canela	LC	BR SI SA CC
154	<i>Myiarchus ferox</i>	Burlisto pico negro	LC	BA BR SI SA CC CD
155	<i>Machetornis rixosa</i>	Caballerizo	LC	BR SI SA VA CC
156	<i>Pitangus sulphuratus</i>	Pitogüé común	LC	BA BR SI SA CC CD

N°	Scientific names	Common name in Spanish	IUCN conservation status	Natural community
157	<i>Megarynchus pitangua</i>	Pitanguá	LC	BA BR SI CC CD
158	<i>Myiozetetes similis</i>	Pitogüé mediano	LC	BA BR SI
159	<i>Myiodynastes maculatus</i>	Pitogüé rayado	LC	BR SA CD
160	<i>Legatus leucophaeus</i>	Tuquito chico	LC	BR SI SA CC CD
161	<i>Empidonomus aurantioatrocristatus</i>	Tuquito gris	LC	BA BR
162	<i>Tyrannus melancholicus</i>	Suiriri real	LC	BA BR SI SA CC
163	<i>Tyrannus savana</i>	Tijereta	LC	VA
164	<i>Sirystes sibilator</i>	Suirirí silbón	LC	BA BR SI CC
165	<i>Arundinicola leucocephala</i>	Lavandera	LC	SI VA
Vireonidae				
166	<i>Cyclarhis gujanensis</i>	Juan chiviro	LC	BA BR SI SA CC CD
167	<i>Vireo chivi</i>	Chiví común	LC	BA BR SI VA CD
Corvidae				
168	<i>Cyanocorax cyanomelas</i>	Urraca morada	LC	BA BR SI SA CC CD
169	<i>Cyanocorax chrysops</i>	Urraca común	LC	BA BR SI SA VA CC CD
Donacobidae				
170	<i>Donacobius atricapilla</i>	Angú	LC	SA
Hirundinidae				
171	<i>Stelgidopteryx ruficollis</i>	Golondrina ribereña	LC	SI SA
172	<i>Progne chalybea</i>	Golondrina doméstica	LC	SI SA
173	<i>Progne tapera</i>	Golondrina parda	LC	SI SA VA
Poliptilidae				
174	<i>Poliptila dumicola</i>	Tacuarita azul	LC	BA BR SI VA
Troglodytidae				
175	<i>Troglodytes aedon</i>	Ratona común	LC	BA BR SI
176	<i>Campylorhynchus turdinus</i>	Ratona grande	LC	BA BR SI SA CC CD
Mimidae				
177	<i>Mimus saturninus</i>	Calandria grande	LC	BA BR SI SA CC
Turdidae				
178	<i>Turdus leucomelas</i>	Zorzal alas canelas	LC	BA BR SI SA CC CD
179	<i>Turdus rufiventris</i>	Zorzal colorado	LC	BA BR
180	<i>Turdus amaurochalinus</i>	Zorzal mandioca	LC	CD
Emberizidae				
181	<i>Passer domesticus</i>	Gorrion	LC	BA
182	<i>Anthus lutescens</i>	Cachirla chica	LC	BA SI SA
183	<i>Euphonia chlorotica</i>	Viví	LC	BA BR SI SA VA CC CD
184	<i>Spinus magellanicus</i>	Cabecita negra	LC	SI CC
185	<i>Ammodramus humeralis</i>	Cachilo ceja amarilla	LC	BR SI SA CC
186	<i>Zonotrichia capensis</i>	Bendito Sea	LC	BA BR SI SA
Icteridae				
187	<i>Cacicus solitarius</i>	Boyero negro	LC	SI
188	<i>Cacicus chrysopterus</i>	Boyero ala amarilla	LC	BA BR SI SA CC CD
189	<i>Cacicus haemorrhous</i>	Boyero cacique	LC	BA BR SI SA
190	<i>Icterus pyrrhopterus</i>	Boyerito	LC	BA BR SI SA CC CD
191	<i>Molothrus rufoaxillaris</i>	Tordo pico corto	LC	BR CC
192	<i>Molothrus bonariensis</i>	Tordo renegrido	LC	VA
193	<i>Molothrus oryzivorus</i>	Tordo gigante	LC	BR
194	<i>Gnorimopsar chopi</i>	Chopí	LC	BR SI SA CC CD
195	<i>Agelaioides badius</i>	Tordo músico	LC	SI
196	<i>Pseudoleistes guirahuro</i>	Chopí estero	LC	BR SI
Parulidae				
197	<i>Setophaga pitiayumi</i>	Pitiayumí	LC	BA BR
198	<i>Myiothlypis flaveola</i>	Arañero amarillo	LC	BA BR SA CD
199	<i>Basileuterus culicivorus</i>	Arañero coronado	LC	BR
Thraupidae				
200	<i>Piranga flava</i>	Fueguero rojo	LC	BR
201	<i>Cyanoloxia brissonii</i>	Reinamora grande	LC	CC

N°	Scientific names	Common name in Spanish	IUCN conservation status	Natural community
202	<i>Paroaria coronata</i>	Cardenal	LC	SA BR
203	<i>Paroaria capitata</i>	Cardenilla	LC	BR
204	<i>Nemosia pileata</i>	Frutero cabeza negra	LC	BA BR SI
205	<i>Eucometis penicillata</i>	Frutero amarillo	LC	BR
206	<i>Tachyphonus rufus</i>	Frutero negro	LC	BA BR SI SA CC
207	<i>Thraupis sayaca</i>	Chogüí	LC	BA BR SI SA CC CD
208	<i>Stilpnia cayana</i>	Saíra pecho negro	LC	BA
209	<i>Tersina viridis</i>	Tersina	LC	BA BR
210	<i>Dacnis cayana</i>	Saí azul	LC	BA CD
211	<i>Conirostrum speciosum</i>	Mielerito azul	LC	BR VA
212	<i>Sicalis flaveola</i>	Canario paraguay	LC	BA VA
213	<i>Sicalis luteola</i>	Chipfu	LC	SI
214	<i>Emberizoides herbicola</i>	Coludo grande	LC	SI
215	<i>Embernagra platensis</i>	Verdón	LC	SI VA
216	<i>Volatinia jacarina</i>	Volatinero	LC	SI
217	<i>Sporophila leucoptera</i>	Corbatita blanco	LC	SI
218	<i>Sporophila pileata</i>	Capuchino boina negra	LC	SI
219	<i>Sporophila angolensis</i>	Curió	LC	BR SI SA
220	<i>Sporophila caerulescens</i>	Corbatita común	LC	BA BR SI VA
221	<i>Coryphospingus cucullatus</i>	Brasita de fuego	LC	BA BR SI CC CD
222	<i>Saltatricula atricollis</i>	Pepitero de corbata	LC	BR SA CC
223	<i>Saltator coerulescens</i>	Pepitero gris	LC	BA BR SI

BA: high forest; BR: riparian or marginal forest; SA: high savanna; SI: floodable savanna; CC: cerrado fields; CD: Cerradón; VA: aquatic vegetation

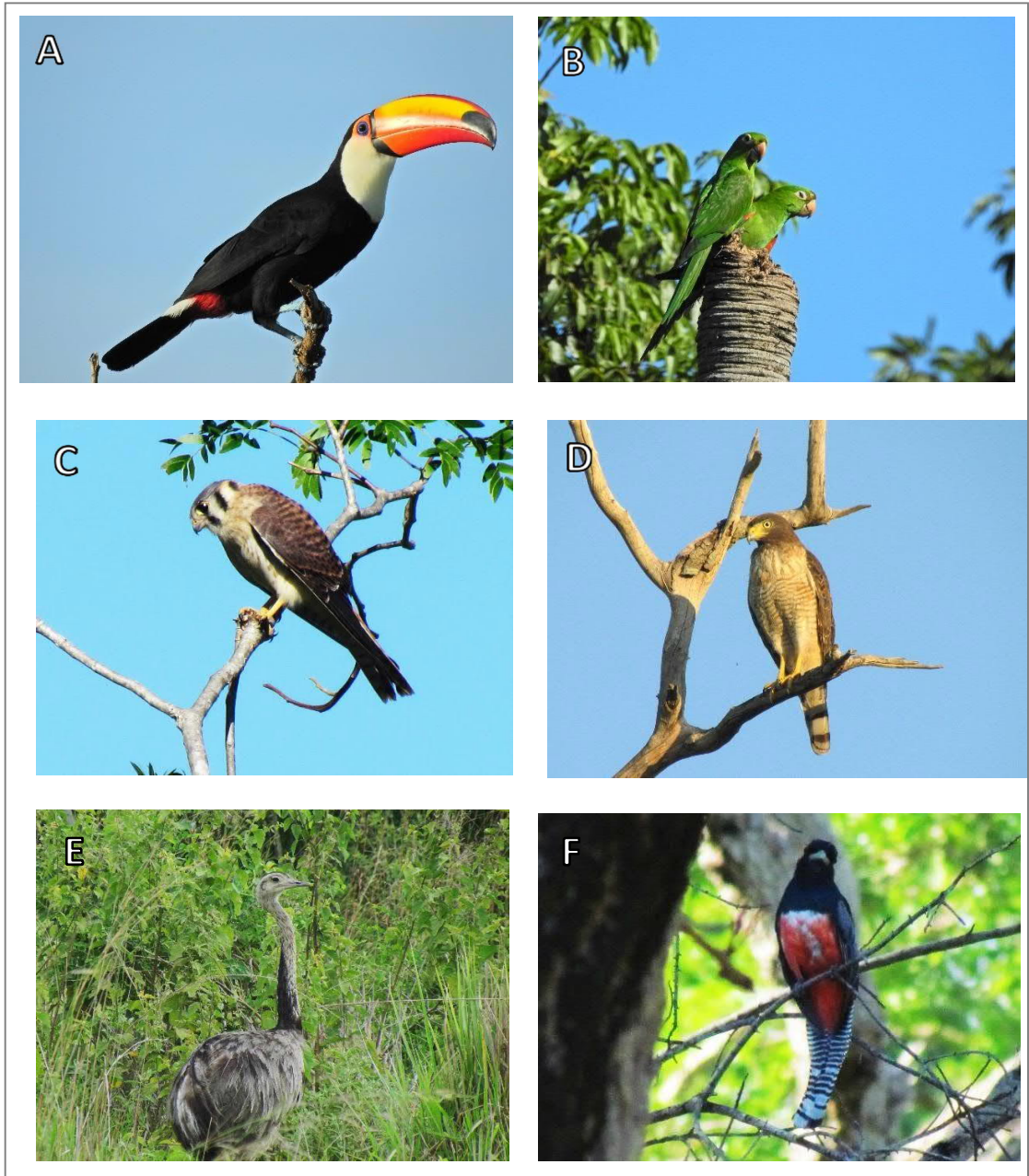


Figure 72 – A. *Ramphastos toco*, B. *Psittacara leucophthalma*, C. *Falco sparverius*, D. *Rupornis magnirostris*, E. *Rhea americana*, F. *Trogon curucui*.

Phot: (Alberto Yanosky y Rebeca Irala)



Figure 73 – G. *Saltator atricollis*, only registered endemic Cerrado species, H. Guacamayo rojo o Gua'a pytä (*Ara chloropterus*)

Photo: (Alberto Yanosky)



Figure 74 – I. *Crax fasciola*, J. *Pipile cumanensis*.

Photo: (Nicolás Cantero & Jimmy Emhart)

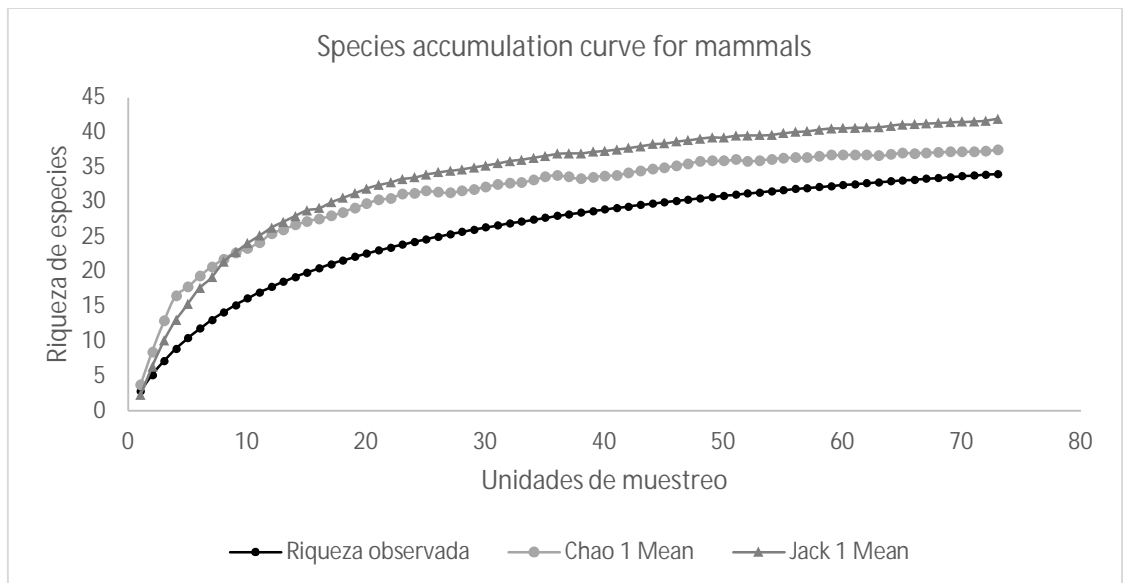
Mammalian survey

A total of 37 mammal species were recorded, corresponding to 10 orders and 19 families. This represents 19% of the species, 100% of the orders and 50% of the families present in Paraguay; it also represents 35% of the species listed as possible. Furthermore, signs of at least three taxa found that could not be identified at species level, as well as two rodents were recorded on camera traps whose identification remains totaling at least five unidentified species. This indicates that 42 mammal species are recorded directly or indirectly during this survey.

A total of 34 species were recorded directly with the systematic sampling, included the species undetermined what represents 80% of the 42 taxa recorded. On the other hand, eight species were recorded indirectly, among them species elusive species such as *Ozotoceros bezoarticus* (Pampas Deer) and *Chrysocyon brachyurus* (Maned wolf), and species of importance for conservation such as *Panthera onca* (jaguar).

The species accumulation curve generated by sampling with camera traps and linear transects indicates that the survey tends towards an asymptote, but that the richness will continue to increase with greater sampling effort. Using only direct records, the Chao 1 richness estimator presents a mean value of 37.5 (95% CI: 34.6 - 52.8), while the Jackknife 1 estimator presents a mean value of 41.9. According to these estimators, during the survey between 80% (Jack 1) and 90% (Chao 1) of the species that could be recorded with the same sampling effort were recorded.

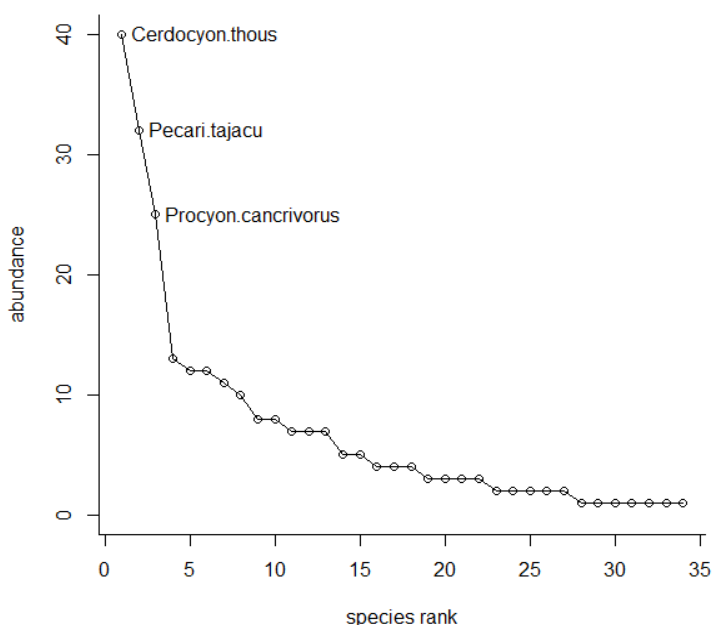
Figure 75 – Species accumulation curve for mammals and richness estimators per sampling unit



Of all the mammals recorded, the order Carnivora is the best represented with a total of five families and 13 species; the Felidae family has the most species (5). The order Rodentia is the second best represented, with a total of five families and six species recorded. Furthermore, 100% of the representatives of the families Myrmecophagidae, Leporidae, Procyonidae, Tapiridae, Dasyproctidae and Cuniculidae in Paraguay were recorded during this survey.

On the basis of direct records, *Cerdocyon thous* (*zorro de monte*) is the most abundant species observed, followed by *Pecari tajacu* (collared peccary) and *Procyon cancrivorus* (*osito lavador*). Other frequently occurring species include *Tapirus terrestris* (tapir), *Dasybus novemcinctus* (*mulita grande*), *Sylvilagus brasiliensis* (*conejito de monte*) and *Hydrochoerus hydrochaeris* (capybara). Records of deer (*Mazama gouazoubira* and *M. americana*) are also quite frequent; however, most of the tracks are not attributable to any one of the two species (Angeli et al. 2014) due to the variability in size of the individuals, making it difficult to determine their specific abundance. On the other hand, *Desmodus rotundus* and *Platyrrhinus lineatus* (bats), *Cavia aperea* (cuis), *Sapajus cay* (capuchin monkey), *Leopardus braccatus* (pantanal cat), *Leopardus pardalis* (ocelot) and *Coendou prehensilis* (large porcupine) were the species with the least direct records made.

Figure 76 – Rank-abundance curve for the mammal community recorded during sampling



The observed species richness varied according to the sampling areas and the natural communities sampled. Among the AM, Gavilán is the one with the highest species richness with 70% of the registered species. On the other hand, among the natural communities, the BR is the one with the greatest wealth observed with a considerable difference with the wealth observed in other natural communities. It is worth mentioning that the CS community was not included in the figure because there were no traces attributable to any species; however, trails and burrows were observed in this community.

Figure 77 – Observed richness by sampling area (AM) and natural community

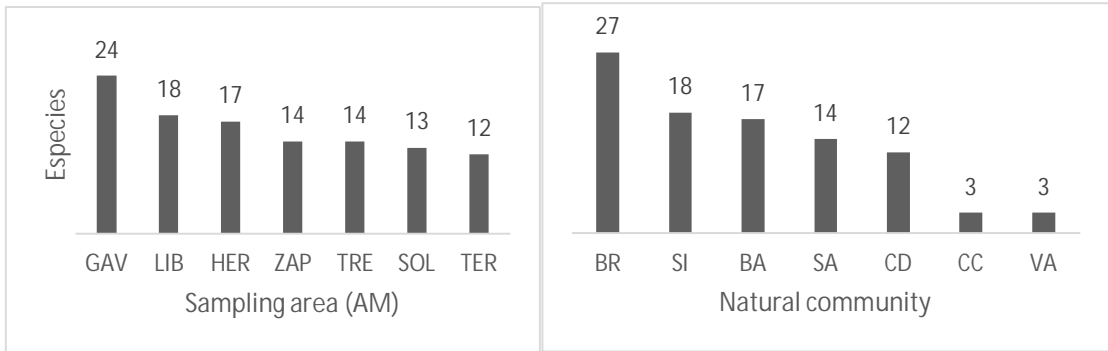
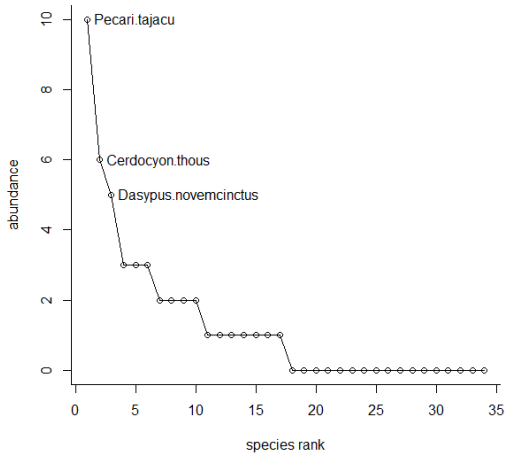
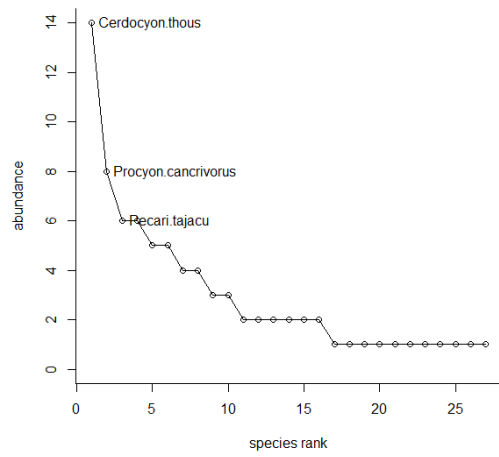


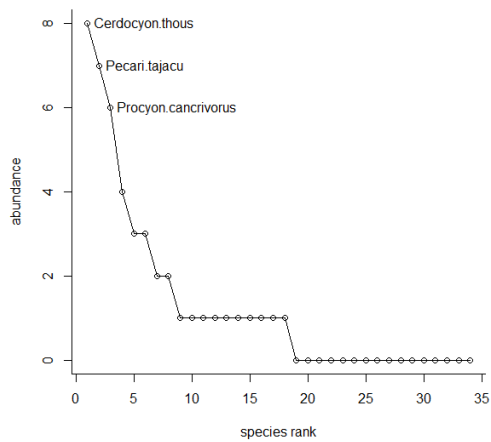
Figure 78 – Rank-abundance curves for mammals per plant community



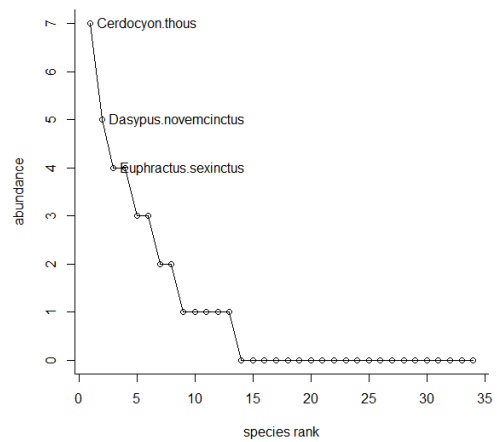
BOSQUE ALTO (BA)



BOSQUE RIBEREÑO (BR)



SABANA INUNDABLE (SI)



SABANA ALTA (SA)

The structure of the mammalian communities presented variations in the different plant communities. In Figure above it is observed that the crab-eating fox is the dominant species in terms of abundance in three of the four analyzed plant communities (BR, SI and SA), while the collared peccary is the dominant species in the BA formation, in the one with the fox in second place. It should be noted that two armadillos presented high abundances in the SA community.

Table 18 – Shannon and Simpon Indexes for mammals per plant community

Indicator (mean)	Plant community				
	All	BA	BR	SA	SI
Taxa/Richness (S)	34	17	27	14	18
Individuals	243	44	83	37	46
Simpson (1-D)	0.926	0.897	0.93	0.88	0.898
Shannon (H)	2.99	2.54	2.93	2.38	2.55

According to the estimated values of the Shannon (H) and Simpson (1-D) indexes for the different plant communities, the uncertainty in predicting a species taken at random in the sample is measured, so it increases as it increases. The representativeness of the species in the sample, that is, it increases with diversity (Magurran, 2004). The Simpson index (D) is a measure of the dominance that a few species present in the analyzed community, that is, the calculated value decreases as diversity increases; For this reason, it is intuitive to use the complement of this index, or the Simpson diversity index (1-D), which is a measure of the degree of equity between the species present in the community (Magurran, 2004). According to the values calculated here, the plant community with the greatest diversity of mammals is the BR.

Regarding species of importance for conservation and of scientific interest, we can highlight the records of *Panthera onca* (jaguar), Near Threatened (NT) internationally and Critically Endangered (CR) in Paraguay, as well as *Chrysocyon brachyurus* (maned wolf), NT under the IUCN and Vulnerable (VU) at the national level. Both species have been recorded indirectly based on the reliable testimonies from local people. Other records of interest include *Leopardus braccatus* (*gato del pajonal*), NT under the IUCN and Data Deficient (DD) at a national level; *Leopardus pardalis* (ocelot), NT in Paraguay; and *Myrmecophaga tridactyla* (giant anteater), *Tapirus terrestris* (tapir) and *Tayassu pecari* (white-lipped peccary), these last three being VU both at national and international levels. Among all the species recorded, eight fall under some category of national or international threat, two are considered DD (lacking data for evaluation) at the international level and one at the national level, while one species (*Sylvilagus brasiliensis*) is not evaluated due to recent changes in its taxonomy. Furthermore, 18 of the recorded species are found in one or another of the CITES appendices.

Species of high conservation interest

Among the registered ones, six of special interest for conservation are identified. Ecological aspects are briefly described following Parera (2017) and Canevari y Vaccaro (2007), their current conservation situations and main features (UICN 2021; APM and SEAM 2017).

Panthera onca or jaguar

Is the biggest cat in the American continent, with solitary habits and mostly nocturnal, he could also be active on a daily basis. Very territorial (make marks on the trunks of trees and deposits to mark their territory). Action range between 10 and more than 300 km², depending on the availability of resources. They inhabit a wide variety of environments between dry and humid forests, pastures, savannas, etc. Predators in the top of the terrestrial trophic red in the neotropics. Tusks: peccaries, carpinchos, pieces, agutíes, armadillos, tapirs, monos, corzuelas, garzas, cigüeñas, peacocks, other carnivorous animals such as ocelotes or pigs, and even domestic animals such as birds and cattle. Their reproduction could take place over the year, in Paraguay it is the most frequent that births occur between November and January. (gestation between 90 and 110 days, layer from 1 to 4 individuals). The care of children is carried out exclusively by the child, the lactation lasts for one semester and the children remain with the mother for 2 years. The population trend of this species is decreasing and the historical distribution of the species has been reduced in different parts giving rise to local extinctions. In the country its main threats are the loss of habitat due to the change in the use of sweat, the cacería and the conflicts with humans due to the predation of cattle.

Leopardus pardalis or ocelot

Medium spotted feline in compact body, cut glue and robust edges. It is fundamentally nocturnal, even in areas without anthropic alteration it also becomes active during the day. It lives in environments with good vegetation cover (wet or dry forests), in the bush steppes. Its area of action is variable depending on the type of environment; the heights could cover an area of 11 km², but males were up to 18 km². It feeds on smaller mammals, birds, amphibious reptiles and even pecces, among its prey we can mention the agutíes, gossips, conejos, lizards and small turtles. In the present reproductive season, it generally has 1 or 2 offspring per layer. Declining population trend in the country is found in the category of Amenazada Casi. Main hazards: loss of habitat and furtive caza for the commercialization of their skin.

Chrysocyon brachyurus or maned wolf

It is the largest size in South America, with very large black legs, the rest of the red skin and a crin over the body and the men. It is basically night and twilight, very rare to see during the day. From solitary habits I could also live in pairs. The range of actions is approximately 30 km². Its diet is omnivorous, and it feeds mainly on small rodents, fruits and insects, it also feeds on birds, trappings, reptiles, amphibians, pieces and cangrejos. Reproduction takes place once a year between April and June. The gestation lasts for a few months and the layer has between 1 and 5 children. An unknown population trend on an international scale, however, in Paraguay its population has declined by less than 30% as a result of the loss and habitat degradation. Threats: trampling, hunting by conflicts with humans due to predation of coral birds, diseases acquired by contact with domestic species.

Myrmecophaga tridactyla or giant anteater

Edentate of long horn and tongue, with a hard and wide coat, with a characteristic coloring with a black base and a white line that crosses over the flanks up to the back.

With solitary and cavernous habits, it is found mainly in open areas such as pastures and wooded savannas, which also inhabit dry and humid forests. Its area of action varies between 3 to 9 km² and feeds exclusively on termites. Its reproduction could take place over the year. The gestation period lasts a little more than 6 months, since each child has a sole. The lactancia lasts around 7 months. Decreasing population trend in Paraguay is estimated to decrease its population size by 30%. Amenazas: loss of habitat, fires, traffic in races and illegal caza.

Tapirus terrestris or tapir

The South American land mammal of larger size. Considered an ingeniero of the ecosystem that modifies the environments that it inhabits opening roads between the vegetation. It inhabits tropical and subtropical jungles, jungles in galleries and chaqueños forests. It is generally solitary and mainly nocturnal, which can also be active during the day. Its area of action ranges from 40 to 65 km², and several individuals can share the same area. Its reproductive age is apparently related to the rains. Gestation lasts between 13 to 14 months, luego de la cual nace a sola cría. Decreasing population trend, a very important decrease in population size was observed in the country, especially in the Eastern Region, where it is estimated that the decrease was 90%. Amenazas: lost and degradation of their habitat, the furtive cacería and the caza for consumption, as well as the great works of large sizes.

Tayassu pecari or White-lipped peccary

The color is the darkest character and is characterized by having the white mind, which gives it the common name in Spanish. It is gregarious, forming large piaras or groups of numerous individuals whose size can vary from 15 to hundreds of individuals. It inhabits tropical and subtropical jungles, dry forests and wetlands and savannas. They are nomads, spread over a wide territory according to the availability of resources. It feeds on fruits, seeds, flowers, leaves, roots, fungi, frogs, ranas, ophidians, and even small mammals. The births can take place all year round, the gestation lasts between 5 to 6 months, from 1 to 4 children (often 2). The population trend is decreasing, and in the country the data suggest an important breakdown on both sides of the Paraguay River. Amenazas: lost and degradation of the habitat, the furtive and consumption cacería, and the advance of the human frontier over wild cacería areas.

The following are pictures of some species recorded by camera traps.

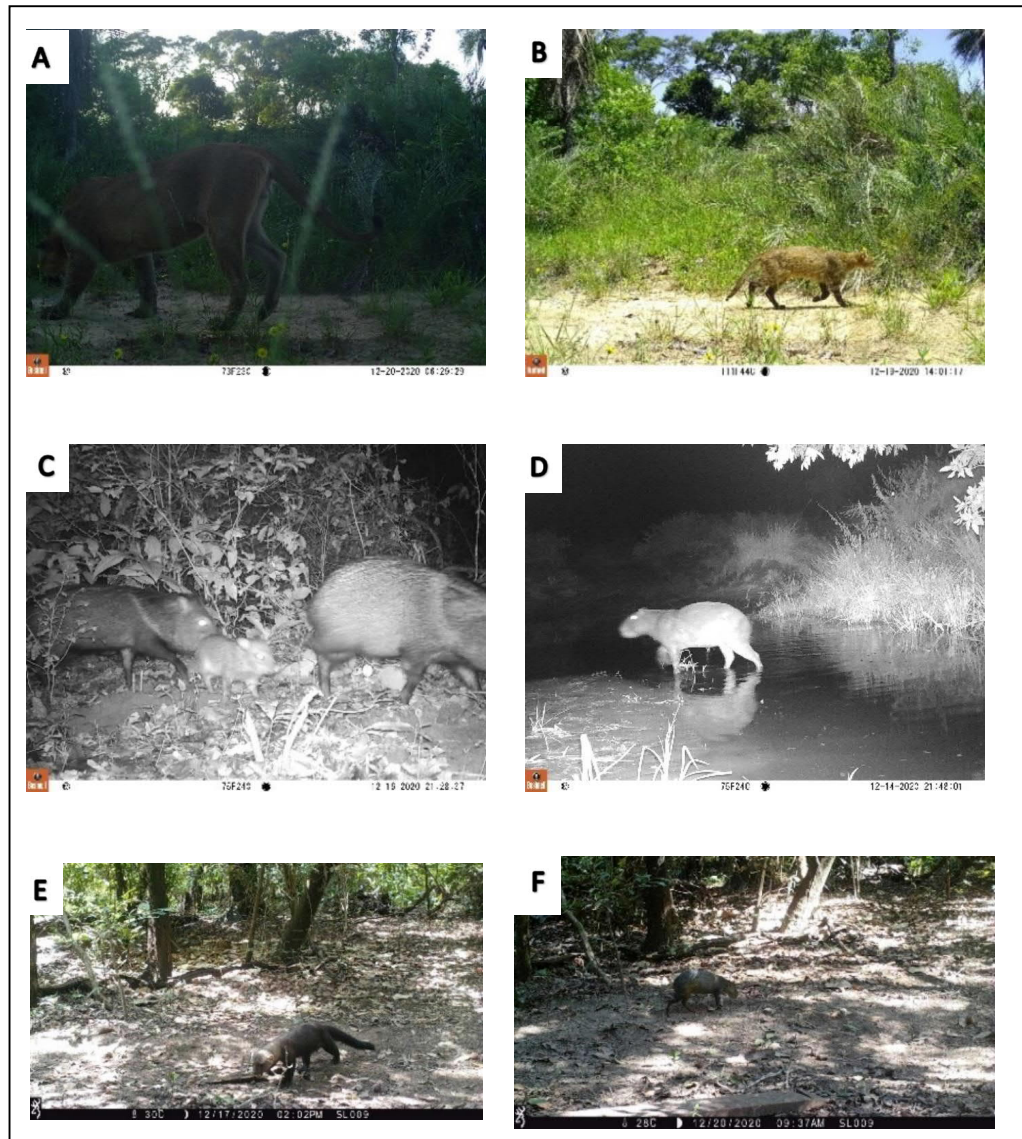


Figure 79 – Trapping of A) *Puma concolor*, B) *Leopardus braccatus*, C) *Pecari tajacu*, D) *Hydrochoerus hydrochaeris*, E) *Eira barbara*, F) *Dasyprocta azarae*.

Photo: (Nicolás Cantero)



Figure 80 – A) *Myrmecophaga tridactyla*, B) *Cerdocyon thous*, C) *Procyon cancrivorus*, D) *Dasyurus novemcinctus*, E) *Mazama sp.*, F) *Eupractus sexcinctus*.
Photo: (NicolásCantero)



Figure 81 – Species, tracks and other signs. Ref.: A) Huellas de *Nasua nasua*, B) Huellas de *Tapirus terrestris*, C) *Sylvilagus brasiliensis*, D) Huellas de *Cavia aperea*, E) *Platyrrhinus lineatus* vista ventral, F) *Platyrrhinus lineatus* vista dorsal.

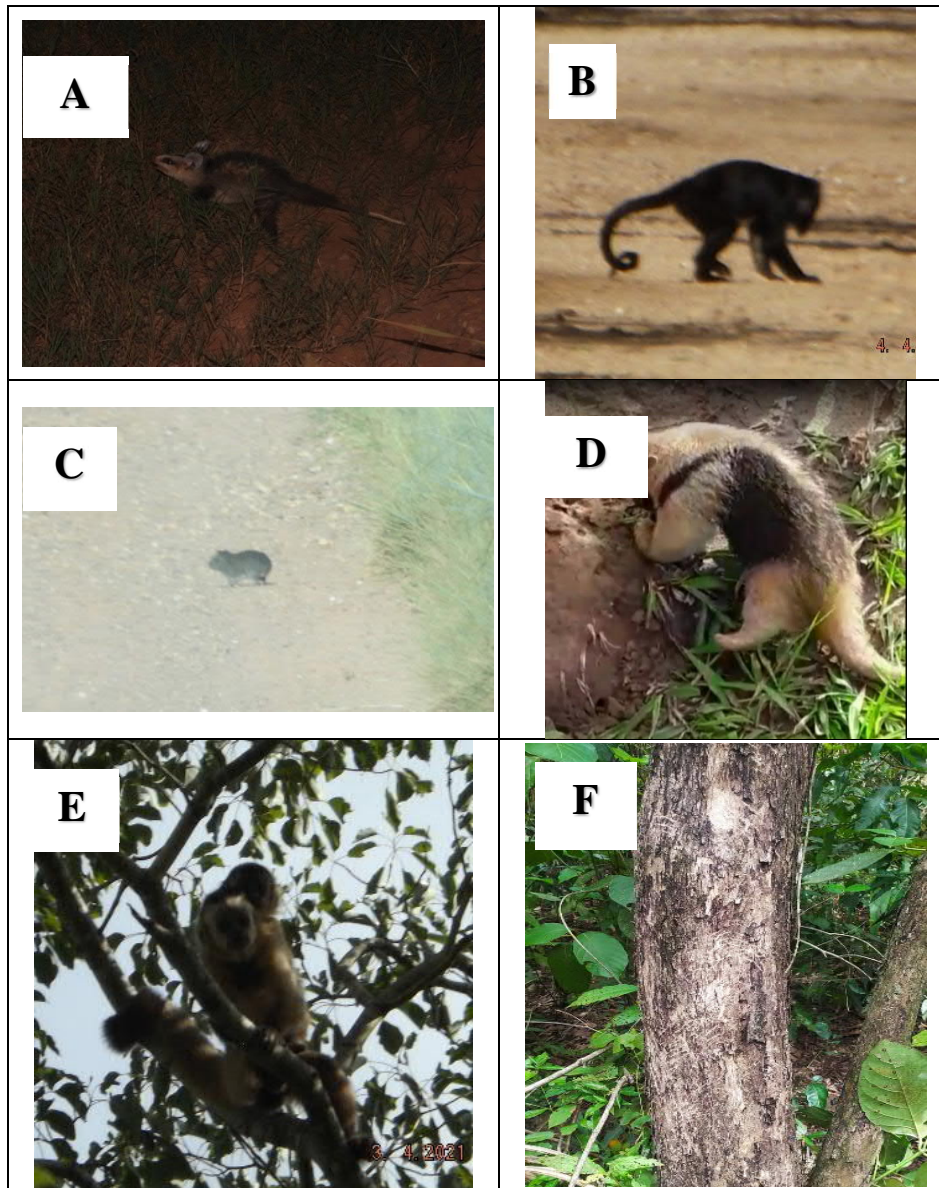


Figure 82 – Photos of mammal speices recorded during sampling. Ref.: A) *Didelphis albiventris*, B) *Alouatta caraya*, C) *Cavia aperea*, D) *Tamandua tetradactyla*, E) *Sapajus cay*, F) Marca de territorio de *Puma concolor*.
 (Cristhian Báez: A, B y E; Diego Bueno: C y F; Gilberto Shupp: F)



Figure 83 – Camera trap records of undetermined species, corresponding to the order Rodentia. (Ambas fotografías fueron obtenidas en el mismo sitio, a 800 metros del casco de Gavilan) (22°37'47.78"S, 56°56'46.78"W). (Nicolás Cantero)

Table 19 – List of recorded taxonomic Orders and Families, and number of species

Order	Family	No. Of species
Didelphimorphia	Didelphidae	2
Cingulata	Dasypodidae	3
Pilosa	Myrmecophagidae	2
Primates	Cebidae	1
	Atelidae	1
Lagomorpha	Leporidae	1
Chiroptera	Phyllostomidae	2
Carnivora	Felidae	5
	Canidae	2
	Mustelidae	3
	Mephitidae	1
	Procyonidae	2
Perissodactyla	Tapiridae	1
Cetartiodactyla	Tayassuidae	2
	Cervidae	3
Rodentia	Erethizontidae	1
	Caviidae	2
	Dasyproctidae	1
	Cuniculidae	1
	Myocastoridae	1

Table 20 – List of mammal species of potential occurrence in the study area

1	<i>Caluromys lanatus</i>	36	<i>Platyrrhinus lineatus</i>	71	<i>Speothos venaticus</i>
2	<i>Chironectes minimus</i>	37	<i>Pygoderma bilabiatum</i>	72	<i>Pteronura brasiliensis</i>
3	<i>Didelphis albiventris</i>	38	<i>Sturnira lilium</i>	73	<i>Lontra longicaudis</i>
4	<i>Gracilinanus agilis</i>	39	<i>Noctilio albiventris</i>	74	<i>Eira barbara</i>
5	<i>Lutreolina crassicaudata</i>	40	<i>Noctilio leporinus</i>	75	<i>Galictis cuja</i>
6	<i>Marmosa paraguayana</i>	41	<i>Cynomops abrasus</i>	76	<i>Conepatus chinga</i>
7	<i>Monodelphis domestica</i>	42	<i>Cynomops planirostris</i>	77	<i>Nasua nasua</i>
8	<i>Philander opossum</i>	43	<i>Eumops auripendulus</i>	78	<i>Procyon cancrivorus</i>
9	<i>Philander frenatus</i>	44	<i>Eumops bonariensis</i>	79	<i>Tapirus terrestres</i>
10	<i>Thylamys macrurus</i>	45	<i>Eumops glaucinus</i>	80	<i>Pecari tajacu</i>
11	<i>Thylamys pusillus</i>	46	<i>Eumops patagonicus</i>	81	<i>Tayassu pecari</i>
12	<i>Dasypus septemcinctus</i>	47	<i>Eumops perotis</i>	82	<i>Mazama americana</i>
13	<i>Dasypus novemcinctus</i>	48	<i>Molossops temminckii</i>	83	<i>Mazama gouazoupira</i>
14	<i>Euphractus sexcinctus</i>	49	<i>Molossus currentium</i>	84	<i>Mazama nana</i>
15	<i>Cabassous tatouay</i>	50	<i>Molossus molossus</i>	85	<i>Ozotoceros bezoarticus</i>
16	<i>Priodontes maximus</i>	51	<i>Promops centralis</i>	86	<i>Akodon montensis</i>
17	<i>Myrmecophaga tridactyla</i>	52	<i>Promops nasutus</i>	87	<i>Akodon toba</i>
18	<i>Tamandua tetradactyla</i>	53	<i>Eptesicus brasiliensis</i>	88	<i>Calomys musculus</i>
19	<i>Sapajus cay</i>	54	<i>Eptesicus diminutus</i>	89	<i>Holochilus vulpinus</i>
20	<i>Aotus azarae</i>	55	<i>Eptesicus furinalis</i>	90	<i>Hylaeamys megacephalus</i>
21	<i>Alouatta caraya</i>	56	<i>Lasiurus ega</i>	91	<i>Necromys Lasiurus</i>
22	<i>Sylvilagus brasiliensis</i>	57	<i>Myotis albescens</i>	92	<i>Nectomys rattus</i>
23	<i>Peropteryx macrotis</i>	58	<i>Myotis levis</i>	93	<i>Oligoryzomys mattogrossae</i>
24	<i>Desmodus rotundus</i>	59	<i>Myotis nigricans</i>	94	<i>Oligorizomys nigripes</i>
25	<i>Glossophaga soricina</i>	60	<i>Myotis riparius</i>	95	<i>Coendou prehensilis</i>
26	<i>Chrotopterus auritus</i>	61	<i>Leopardus geoffroyi</i>	96	<i>Coendou spinosus</i>
27	<i>Lophostoma silvicolium</i>	62	<i>Leopardus guttulus</i>	97	<i>Cavia aperea</i>
28	<i>Macrophyllum macrophyllum</i>	63	<i>Leopardus pardalis</i>	98	<i>Hydrochoerus hydrochaeris</i>
29	<i>Phyllostomus hastatus</i>	64	<i>Leopardus wiedii</i>	99	<i>Dasyprocta azarae</i>
30	<i>Tonatia bidens</i>	65	<i>Puma concolor</i>	100	<i>Cuniculus paca</i>
31	<i>Carollia perspicillata</i>	66	<i>Puma yagouaroundi</i>	101	<i>Clyomys laticeps</i>
32	<i>Artibeus fimbriatus</i>	67	<i>Panthera onca</i>	102	<i>Thrichomys fosteri</i>
33	<i>Artibeus lituratus</i>	68	<i>Cerdocyon thous</i>	103	<i>Myocastor coypus</i>
34	<i>Artibeus planirostris</i>	69	<i>Chrysocyon brachyurus</i>		
35	<i>Chiroderma doriae</i>	70	<i>Lycalopex gymnocercus</i>		

Table 21 – Taxonomic list of mammal species

	Scientific names	Common name in Spanish	IUCN Conservation status	Natural Community
Didelphimorphia				
Didelphidae				
1	<i>Chironectes minimus</i>	Comadreja de agua	LC	BR
2	<i>Didelphis albiventris</i>	Comadreja común	LC	BA BR AA
Cingulata				
Dasypodidae				
3	<i>Dasypus novemcinctus</i>	Mulita grande	LC	BA BR SI
4	<i>Eupractus sexinctus</i>	Armadillo de seis bandas	LC	BA BR
5	<i>Cabassous unicinctus</i>	Armadillo de cola pelada	LC	SI AA
Pilosa				
Myrmecophagidae				
6	<i>Myrmecophaga tridactyla</i>	Oso hormiguero gigante	VU	BR CD AA
7	<i>Tamandua tetradactyla</i>	Tamandua	LC	BR CD AA
Primates				
Cebidae				
8	<i>Sapajus cay</i>	Mono capuchino	LC	BR
Atelidae				
9	<i>Alouatta caraya</i>	Mono aullador negro		BA
Lagomorpha				
Leporidae				
10	<i>Sylvilagus brasiliensis</i>	Conejito de monte	NE	BR CD
Chiroptera				
Phyllostomidae				
11	<i>Desmodus rotundus</i>	Vampiro común	LC	
12	<i>Platyrrhinus lineatus</i>	Murciélago listado de Geoffroy	LC	
Carnivora				
Felidae				
13	<i>Leopardus braccatus</i>	Gato del pajonal	NT	BR
14	<i>Leopardus pardalis</i>	Ocelote	LC	BR
15	<i>Herpailurus yagouaroundi</i>	Gato Moro	LC	BA CD
16	<i>Puma concolor</i>	León, puma	LC	BR SI CD
17	<i>Panthera onca</i>	Tigre, jaguar	NT	
Canidae				
18	<i>Cerdocyon thous</i>	Zorro de monte	LC	BA BR SI CD AA
19	<i>Chrysocyon brachyurus</i>	Lobo de crin	NT	
Mustelidae				
20	<i>Lontra longicaudis</i>	Nutria	NT	
21	<i>Eira barbara</i>	Hurón mayor	LC	BR SI
22	<i>Galictis cuja</i>	Hurón menor	LC	

	Scientific names	Common name in Spanish	IUCN Conservation status	Natural Community
Mephitidae				
23	<i>Conepatus chinga</i>	Zorrino	LC	BR SI
Procyonidae				
24	<i>Nasua nasua</i>	Coatí	LC	BA BR
25	<i>Procyon cancrivorus</i>	Osito lavador, mayuato	LC	BA BR SI VA CD AA
Perissodactyla				
Tapiridae				
26	<i>Tapirus terrestris</i>	Tapir, anta	VU	BA BR CD
Cetartiodactyla				
Tayassuidae				
27	<i>Pecari tajacu</i>	Pecarí de collar	LC	BA BR SI CD
28	<i>Tayassu pecari</i>	Pecarí labiado	VU	BA BR
Cervidae				
29	<i>Mazama americana</i>	Corzuela roja	DD	BA BR VA
30	<i>Mazama gouazoubira</i>	Corzuela parda	LC	BR SI CD AA
31	<i>Ozotoceros bezoarticus</i>	Venadillo, Ciervo de las Pampas	NT	SI CC AA
Rodentia				
Erethizontidae				
32	<i>Coendou prehensilis</i>	Puercospín grande, coendú	LC	
Caviidae				
33	<i>Cavia aperea</i>	Cuis	LC	BR
34	<i>Hydrochoerus hydrochaeris</i>	Carpincho	LC	SI VA CD
Dasyproctidae				
35	<i>Dasyprocta azarae</i>	Agutí amarillo	DD	BA BR CD
Cuniculidae				
36	<i>Cuniculus paca</i>	Paca	LC	BA BR
Myocastoridae				
37	<i>Myocastor coipus</i>	Coipú	LC	VA

Table 22 – Speies of mammals and type of records

Nro.	Scientific names	Common names	cited	recorded	mentioned
1	<i>Chironectes minimus</i>	Comadreja de agua	X	X	-
2	<i>Didelphis albiventris</i>	Comadreja común	X	-	X
3	<i>Dasyopus novemcinctus</i>	Mulita grande	X	X	X
4	<i>Eupractus sexinctus</i>	Armadillo de seis bandas	X	X	X
5	<i>Cabassous unicinctus</i>	Armadillo de cola pelada	X	X	X
6	<i>Myrmecophaga tridactyla</i>	Oso hormiguero gigante	X	X	X
7	<i>Tamandua tetradactyla</i>	Tamandua	X	X	X
8	<i>Sapajus cay</i>	Mono capuchino	X	X	X
9	<i>Alouatta caraya</i>	Mono aullador negro	X	X	X
10	<i>Sylvilagus brasiliensis</i>	Conejito de monte	X	X	X
11	<i>Desmodus rotundus</i>	Vampiro común	X	X	X
12	<i>Platyrrhinus lineatus</i>	Murciélago listado de Geoffroy	X	X	-
13	<i>Leopardus braccatus</i>	Gato del pajonal	-	X	-
14	<i>Leopardus pardalis</i>	Ocelote	X	X	X
15	<i>Herpailurus yagouaroundi</i>	Gato Moro	X	X	X
16	<i>Puma concolor</i>	León, puma	X	X	X
17	<i>Panthera onca</i>	Tigre, jaguar	X	-	X
18	<i>Cerdocyon thous</i>	Zorro de monte	X	X	X
19	<i>Chrysocyon brachyurus</i>	Lobo de crin	X	-	X
20	<i>Lontra longicaudis</i>	Nutria	X	-	X
21	<i>Eira barbara</i>	Hurón mayor	X	X	X
22	<i>Galictis cuja</i>	Hurón menor	X	-	X
23	<i>Nasua nasua</i>	Coatí	X	X	X
24	<i>Conepatus chinga</i>	Zorrino	X	-	X
25	<i>Procyon cancrivorus</i>	Osito lavador, mayuato	X	X	X
26	<i>Tapirus terrestris</i>	Tapir, anta	X	X	X
27	<i>Pecari tajacu</i>	Pecarí de collar	X	X	X
28	<i>Tayassu pecari</i>	Pecarí labiado	X	X	X
29	<i>Mazama americana</i>	Corzuela roja	X	X	X
30	<i>Mazama gouazoubira</i>	Corzuela parda	X	X	X
31	<i>Ozotoceros bezoarticus</i>	Venadillo, Ciervo de las Pampas	X	-	X
32	<i>Coendou prehensilis</i>	Puercospín grande, coendú	X	X	X
33	<i>Cavia aperea</i>	Cuis	X	X	X
34	<i>Hydrochoerus hydrochaeris</i>	Carpincho	X	X	X
35	<i>Dasyprocta azarae</i>	Agutí amarillo	X	X	X
36	<i>Cuniculus paca</i>	Paca	X	X	X
37	<i>Myocastor coipus</i>	Coipú	X	-	X

Species registration by observation, trails and other signs.



Figure 84 – A) Huellas de *Nasua nasua*, B) Huellas de *Tapirus terrestris*, C) *Sylvilagus brasiliensis*, D) Huellas de *Cavia aperea*, E) *Platyrrhinus lineatus* vista ventral, F) *Platyrrhinus lineatus* vista dorsal.

6.1.4.2 Primary Data – Dry Season

The primary data for the dry season is presented together with the primary data for the rainy season, which are described in the CSI final report (ANNEX I).

Ichthyological survey

The 81 species that make up the ichthyofauna surveyed represent 26% of the ichthyofauna in Paraguay, according to the Koerber, Vera & Reis (2017) checklist. In total, 27 Families distributed in 7 Orders were registered, being the Order CHARACIFORMES with 10 Families the one with the greatest richness, within which Characidae (Mojarras) is the Family with the highest number of species recorded (23 species).

During the rainy season survey, 64 species were found, the most abundant species was *Odontostilbe pequirá* (Mojarrita). In the campaign corresponding to the dry season, 62 species were identified, of which 17 were new, the most abundant species was *Corydoras aeneus*, this species had great dominance in several AMs, in this campaign two new groups were recorded, corresponding to the Order of MYLIOBATIFORMES, which are the freshwater stingrays and SYNBRANCHIFORMES, commonly called “eels”.

Herpetological survey

In both campaign, rainy and dry season, a total of 59 species (33 amphibians and 26 reptiles) were recorded and this represents 13 families (4 of amphibians and 9 of reptiles).

During the rainy season, a total of 31 species (24 amphibians and 7 reptiles) were recorded along the transects, while another nine amphibians and 14 reptile species were recorded during random searches and at breeding grounds in the entire study area.

In the dry season, 24 species (16 of amphibians and 8 of reptiles) were recorded in the transects, plus 3 species of amphibians and 6 of reptiles in occasional sightings, for a total of 31 species (19 of amphibians and 12 of reptiles). Representing a lower number of species found compared to the rainy season, where 14 species of amphibians and 9 more reptiles were recorded.

No new species of amphibian was recorded, but two species of snakes were added to the general list, these are *Palusophis bifossatus* and *Erythrolamprus typhlus* and three lizards, *Tropidurus torquatus*, *Stenocercus caducus* and *Colobosaura modesta*.

Ornithological survey

A total of 260 species of birds were recorded, belonging to 26 orders and 50 taxonomic families, including the Tyrannidae (15%), Thraupidae (11%), Furnariidae and Psittacidae (6%) families with most species recorded. The dominant species of the first most abundant family varied during the wet and dry seasons, being the most common during the first season: *Tyrannus melancholicus*, *Megarynchus pitangua*, *Myiarchus tyrannulus* and *Empidonomus aurantioatrocristatus*, which by the shape of the beak hunt larger insects in flight, unlike the drier season, where the availability of various flying invertebrates is reduced, in addition, these birds carry out regional migrations, therefore, they are replaced by other residents and / or migrants from the south, registered in the winter campaign, which were: *Xolmis velata*, *Xolmis irupero*, *Xolmis cinereus*, *Hymenops perspicillatus*, *Myiarchus ferox*, among the most common. The increase in the number of registered species of the Trochilidae family stands out, compared to the summer campaign in the wet season, which, according to Oliveira and Marquis (2002),

is probably a general phenomenon during the dry season since these species make a movement local towards gallery forests. In some cases, towards specific and fundamental plants in their habitats that bloom only for very limited periods and provide much-needed resources this season. The same authors mention that 90% of fruits available in the forest for consumption in forests and cerrados is due to parrots such as *Amazona* spp. and *Ara* spp., species that after eating part of these fruits, let them drop and are later consumed and dispersed by other birds or small mammals.

Mammalian survey

A total of 63 mammal species were recorded, 38 corresponding to 10 orders and 20 families in a first instance and later with a special effort focused on bats, 25 species were added. This represents 31% of the species, 100% of the orders and 50% of the families present in Paraguay; it also represents 35% of the species listed as possible. Furthermore, signs of at least three taxa found that could not be identified at species level, as well as two rodents were recorded on camera traps whose identification remains totaling at least five unidentified species.

This indicates that 42 mammal species are recorded directly or indirectly during this survey. The following analysis is referred to the general surveys of mammals developed in first instance and followed by a deeper based on the survey and findings of bat monitoring.

A total of 35 species were recorded directly with the systematic sampling, included the species undetermined what represents 83% of the 43 taxa recorded. On the other hand, eight species were recorded indirectly, among them species elusive species such as *Ozotoceros bezoarticus* (Pampas Deer) and *Chrysocyon brachyurus* (Maned wolf), and species of importance for conservation such as *Panthera onca* (jaguar).

6.1.5 Environmental DNA (eDNA) Analysis

According to Thomsen et al, the continuous decline in Earth's biodiversity represents a major crisis and challenge for the 21st century, and there is international political agreement to slow down or halt this decline. The challenge is in large part impeded by the lack of knowledge on the state and distribution of biodiversity – especially since the majority of species on Earth are un-described by science. All conservation efforts to save biodiversity essentially depend on the monitoring of species and populations to obtain reliable distribution patterns and population size estimates. Such monitoring has traditionally relied on physical identification of species by visual surveys and counting of individuals.

However, traditional monitoring techniques remain problematic due to difficulties associated with correct identification of cryptic species or juvenile life stages, a continuous decline in taxonomic expertise, non-standardized sampling, and the invasive nature of some survey techniques. Hence, there is urgent need for alternative and efficient techniques for large-scale biodiversity monitoring.

Environmental DNA (eDNA) – defined as: genetic material obtained directly from environmental samples (soil, sediment, water, etc.) without any obvious signs of biological source material – is an efficient, non-invasive and easy-to-standardize sampling approach. Coupled with sensitive, cost-efficient and ever-advancing DNA sequencing technology, it may be an appropriate candidate for the challenge of biodiversity monitoring.

Environmental DNA (eDNA) – defined as: genetic material obtained directly from environmental samples (soil, sediment, water, etc.) without any obvious signs of biological source material – is an efficient, non-invasive and easy-to-standardize sampling approach. Coupled with sensitive, cost-efficient and ever-advancing DNA sequencing technology, it may be an appropriate candidate for the challenge of biodiversity monitoring.

Results from eDNA approaches have provided valuable insights to the study of ancient environments and proven useful for monitoring contemporary biodiversity in terrestrial and aquatic ecosystems in large areas.

It was considered 115 samples in PARACEL forest lands. The following picture presents the monitoring points.

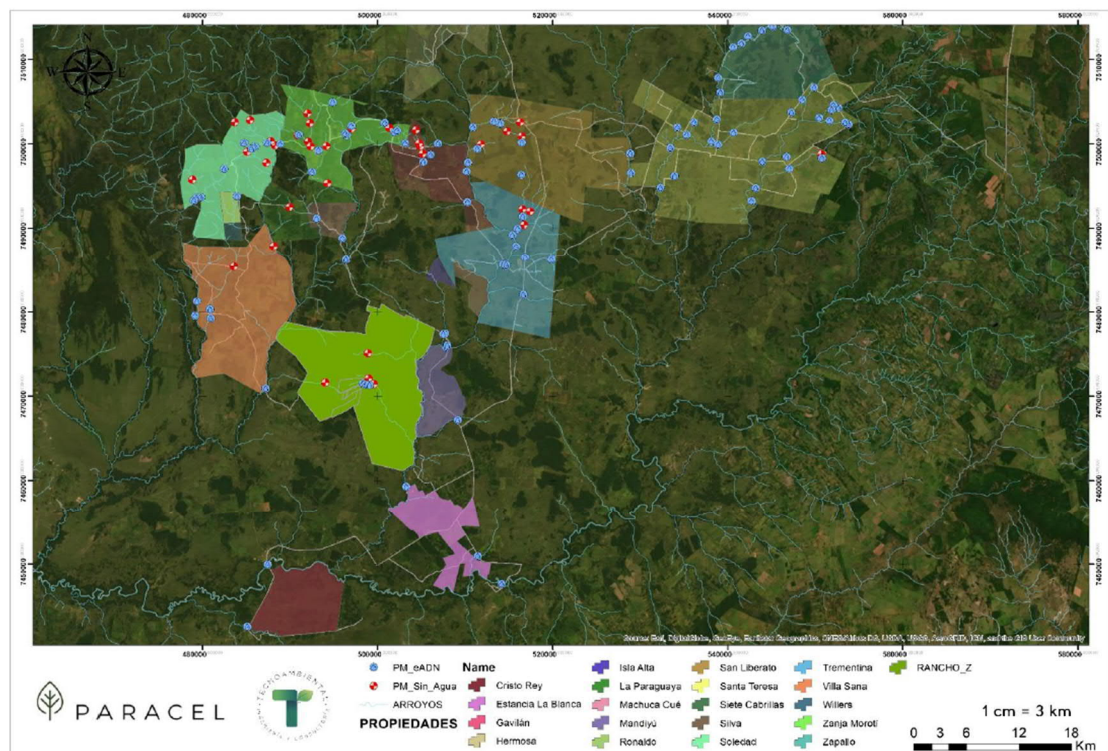


Figure 85 – Monitoring Points

NatureMetrics (2021)² has presented the result of the analysis of 115 samples collected. These samples showed evidence for 357 taxa with an average taxonomic richness of 39.9 (4 to 90) with the most abundant sequence for *Pimelodella* sp., and the most commonly detected species being *Hoplias* sp.

A total of 357 taxa were detected. 39.5% (141 taxa) were at least 99% similar to species in the global reference databases, and species names are suggested for these taxa. The remaining taxa were identified to the lowest possible taxonomic level: 40% to genus (143 taxa), 9.8% to family (35 taxa), and the remainder to order (38 taxa). The taxa belong to 5 classes, 38 orders, 90 families, and 188 genera. The taxon count per class was: 195 fish, 30 amphibians, 78 birds, 50 mammals, and 4 reptiles. Note that taxa are

² NatureMetrics. 2021. Vertebrate Metabarcoding Results. Paracel S.A., 12 pp.

approximately equivalent to species but some over-and under-estimation of diversity in some lineages is possible.

Species of note included eight species categorised on the IUCN Red List: turquoise-fronted Amazon (NT, *Amazona aestiva*), greater rhea (NT, *Rhea americana*), Neotropical otter (NT, *Lontra longicaudis*), Chacoan naked-tailed armadillo (NT, *Cabassous chacoensis*), and black-and-gold howler monkey (NT, *Alouatta caraya*), White-lipped peccary (VU, *Tayassu pecari*), South American tapir (VU, *Tapirus terrestris*), and Giant anteater (VU, *Myrmecophaga tridactyla*). These were generally limited to a small number of samples, except the Neotropical otter, South American tapir, and Giant Anteater which were found in 11, 10, and 8 of 14 Properties respectively. The number of threatened species detections per sample varied from 0 (51 samples) to 5 (1 sample).

The average species richness was 39.9 and ranged from 4 (HE-HU09) to 90 (CR-AQU07). A three-barbeled catfish species (*Pimelodella sp.*), which accounted for 7.34% of the total sequence reads, was among the most abundant in terms of sequences. Among the most commonly detected species were a trahiras fish species (*Hoplias sp.*), a characid fish species (*Characidae sp.*), and a pike cichlid (*Crenicichla lepidota*), which were detected in 101, 98, and 92 of the samples, respectively.

The complete report of NatureMetrics with the eDNA analysis and the results are presented in **ANNEX II**.

6.1.6 Discussion – Flora, Fauna and eDNA

Overall, the findings of this study exceed the expectations in terms of creating a biodiversity baseline for both flora and fauna carried out over the 29.5 of effective field work both in flora and fauna monitoring. These monitoring days resulted in an investment of 4.21 days per sampling area for both seasons. The evidence given by the complementary species shows the rich biodiversity for the study area.

A total of 700 plant species, belonging to 97 botanical families were recorded: 22 pteridophytes, 139 monocots, 539 dicots. The study made it possible to survey and classify the plant formations of one of the most threatened and less known ecoregions at a country level, despite its importance at a regional and global level. The current knowledge of its biodiversity is based mainly on floristic studies dating back more than 100 years. The most recent studies were carried out within the last three decades, and were mainly based on the application of the REA methodology in preparation for the Technical Justifications and draft Management Plans for Protected Areas. There are also a few floristic studies of specific taxa that have been carried out by local and foreign specialists.

Despite the fact that the Cerrado formations in Paraguay occur as isolated mosaics within various ecoregions -such as Alto Paraná, Amambay and principally the Aquidabán (MADES 2013) in the Eastern Region of the country, as well as the Cerrado ecoregion in the Western Region- many typical species are common among them, although some are exclusive. Regarding the floristic diversity of the formations corresponding to the Cerrado phytophysionomies represented by the Cerradón, Campo Cerrado and Campo Sucio, in a comparative study carried out with 411 of the 700 species registered for the study area (which includes those identified by genus and morphospecies), it was found that there is a floristic affinity of 30-57% between these

and the phytofisionomies of the Cerrado present in the departments of Canindeyu and Concepción. It was compared with the studies carried out by Peña-Chocarro et al. (2010), in the Mbaracayú Forest Nature Reserve, SEAM/UNDP/GEF (2006) in the Paso Bravo National Park, and Rojas Bonzi et al. (2020) in the Serranía San Luis National Park, when analyzing only those identified up to the species level of the 282 species recorded within the PARACEL project area (December 2021 campaign), we can confirm that the majority of them are in common. There are 162 species (57%) in common with the Mbaracayú Forest Nature Reserve, 127 species (45%) in common with the Paso Bravo National Park, and 85 species (30%) in common with the Serranía San Luis National Park. The complete list of analyzed/determined species is included in the Vegetation and Flora.

The formations of savannas and especially those that are linked to water (periodically flooded, flooded or with permanent water), are dynamic ecosystems, whose species - mostly annual, biannual or perennial herbaceous - are adapted to fluctuations in water and other environmental factors that determine the presence or absence of species in different seasons. Due to their floristic diversity and the presence of water, these sites are places of passage and feeding for the local fauna, which contributes to the pollination and dispersal of plant species.

In the flooded savannas, which generally develop in the lower portions of the land, it is possible to find variants with water (marshes, swamps, bodies of water) and without water (dry savannas), disparities that would also influence the richness of species found. The presence of "Islets" in this formation adds a floristic diversity, mainly woody ones, which play a very important role for the local fauna, such as provision of perch, nesting and feeding place, refuge, etc. In the main matrix, these islands generally occupy the highest parts of the terrain. For more information on this matter please see The islets of forests.

Mereles (2007) affirms forests are formations that exceed 5 m in height. In their vertical structure, they can have 3-4 strata of vegetation, reaching the primary layer or higher at a maximum height of 25 m. In most of them, the height of the trees in the first canopy no longer exceeds 15-18 m. In its horizontal structure there are several forms of life, such as: various herbaceous, shrubs, vines, epiphytes and trees; according to the geographic location where they are. In the case of the forest remnants studied, the riparian or marginal forest was the one that presented the greatest floristic diversity, compared to the high degraded forest, probably due to the degradation (extraction of timber) observed in the latter, in addition to the greater applied sampling intensity. In the Riparian or Marginal Forest, apart from the typical species of this formation, floristic elements belonging to the Cerrado phytophysionomy were recorded.

The fact that, although the study area is located at the extreme northwestern distribution of the Alto Parana Atlantic Forest (BAAPA), more than 40% of the tree species registered in the forest formations, High Forest and Riparian Forest, are common to the BAAP (Spichiger et al. 1992). On the other hand, it is important to point out that some species such as *Amburana cearensis* (clover), *Myroxylon peruiferum* (red incense) and *Syagrus oleracea* (guaviroba), are typical of the Cerrado Ecoregion, with a restricted distribution in the country.

Although there are recent studies and literature that make reference to the presence of several endemisms (Pena-Chocarro & De Egea 2018), as well as important plant genetic resources (De Egea et al. 2018) for food and agriculture -aspects of great

importance and relevance worldwide- a more detailed analysis is required for a better assessment of the floristic resources present in the study area based on the high potential they represent; this, however, is beyond the objective and scope of this biodiversity baseline.

Among the four taxa evaluated, 438 species of vertebrates were recorded (81 fish, 59 amphibians & reptiles, 260 birds and 38 mammals), corresponding to 110 taxonomic families with some additional species of invertebrates. The collected species information of fauna presents all the necessary evidence for their confirmation within the site, thus making an innovative contribution towards the knowledge of this transitional area between the Cerrado and the Humid Chaco and Atlantic Forest.

With regard to the ichthyofauna within the study area, we can mention the records of an additional 13 species of fish to the number already documented for the Aquidabán River (Insaurralde et al. 2012). Nevertheless, these lists share three species (*Charax leticiae*, *Moenkhausia dichroua* and *Pyrhulina australis*) between both places. The diversity of herpetofauna is considered to be high, and the use of transects for the active search of amphibians & reptiles is one of the most useful and feasible methods for rapid assessments and to get an idea of the composition of an area.

Regarding the threatened species, the anurans *Rhinella scitula* and *Dendropsophus elianae* are endemic species to the Cerrado, which also have their general distributional limits within the country. On the other hand, the reptiles *Chelonoidis carbonaria* and *Caiman latirostris* present other conservation challenges. These latter four species -two frogs, one tortoise and one caiman- could be the indicator species for the herpetofauna of the site.

Of the 460 documented species of birds (historical and recent records) for the Concepción Department (eBird 2020), 260 species (56.4%) were recorded during the best time of year for birdwatching, coinciding with the end of the breeding season for Neotropical birds (Hayes 2014) and for this most of the species were found active and also austral nesting migratory birds which initiate their migration to the north at the end of the summer in the Southern Hemisphere (Guyra Paraguay 2004). We had expected to find more endemic species cited for the *Cerrado* in Paraguay (Silva 1997), though endemic species of other ecological regions were recorded such as those of the BAAPA and the Dry Chaco. Similarly, it was expected to record other species associated with plant formations and natural communities typical of this ecoregion, such as seedeaters (*Sporophila* spp.) and other birds associated with natural grasslands and savannas, as well as other species of Macaw that could inhabit the area. This absence could respond to the modification of native grasslands habitats for productive activities (areas in which the woody vegetation - shrubs and coco palms, is removed, implanted forests, etc.) which could affect the availability of proper habits for these particular species. Despite this situation, several individuals of *Rhea americana* were recorded in all sampled sites within diverse habitats with natural grasslands or sabanoid-like environments ; this species conservation status is NT globally, as well as other species which are dependent of open areas such as *Seriema cristatan*, *Nothura maculosa*, *Rynchotus rufescens*, and those of floodable or humid savannas such as *Emberizoides* spp. and particular seedeaters occurring in these Cerrado formations as the savannas of tall grasses, among them *Sporophila plumblea*, recorded in the dry season monitoring.

Nevertheless, it is worth mentioning that other species of interest that occur in the *Cerrado* were also found, which fall under different levels of national and international

conservation status, in addition to the species that use this area as a stopover within their regional migratory routes, as well as other lesser known and under-recorded species in the region that use the habitats available at the site to complete their biological cycles. These are potential indicator species of the environmental quality and current condition of the study area. Among these species of interest, we can mention the Red Macaw (*Ara chloroptera*) which stands out as the flagship species of the *Cerrado* and in danger of extinction at a national level, given that this ecoregion is one of the last relics with the presence of a free population. Fifty-nine percent of the country's parrot species were recorded in the area and this entire order is included in Appendix II of CITES; they deserve certain protection actions related to trade, in order to avoid the reduction of their free populations. This is the family with the highest number of species of conservation concerns both at global and local levels; among them *Alipiopsitta xanthops*, endemic to the *Cerrado*, Endangered and NT. Both Psittacidae may be considered flagship species for the study area. *Crax fasciolata* and *Pipile cumanensis* are other species of interest, since the presence and abundance of both could indicate the quality of their habitat (mature forests and riparian forests), as well as help to evaluate their conservation status (Laño et al. 2018). *Crax fasciolata* is threatened with extinction at a local level and Vulnerable at an international level, meanwhile *Pipile cumanensis* is Near Threatened at an international level, mainly due to habitat loss, unregulated hunting, and to a lesser extent, captured as pets. There are few studies of these species in Paraguay; consequently, their monitoring could be key to the design of strategies for their conservation.

We can highlight the findings for the order Carnivora, with the highest level of representation, and the Felidae family in particular with the observation of five of the eight species of felines in Paraguay. This phenomenon could reflect that the carnivore community, and therefore its prey, are in good condition; however, more profound studies should be carried out to better understand their conservation status.

All the species recorded during this campaign were “expected” for the area, with the exception of *L. braccatus*, whose record comes as a surprise considering the known distribution of the species (Nascimento et al. 2020), which reveals how poorly studied the mammalian fauna is in the region. The observed richness at each of the different localities does not necessarily reflect their true richness; for example, in the case of San Liberato and Hermosa with little sampling effort, we found a high species richness, what indicates these areas are very used by mammals. Something similar happens with the various natural communities, where the observed richness does not necessarily reflect the actual richness of these communities. This is due to the fact that the collection of data has different levels of effectiveness for the various communities and the sampling effort was not equal in all the communities explored. In rocky soils and grasslands for example, the likelihood of species detection by signs and prints was low, most of the records found in these sites were burrows in termite-hills (*takuru*), feces or prints in clearings where mud was present. One common problem was the permanent presence of livestock prints prohibiting this to detect mammals' trails. Species with few records (sightings), such as the cuis (*apereá*), the porcupine, the bats and the capuchin monkey, do not reflect the true abundance of these species since they are difficult to detect due to their habits, as well as the type of sampling implemented. On the other hand, it is highly likely that the pantanal cat has a very low abundance, taking into consideration that its "rarity" and elusive nature are widely known (Pereira & Aprile 2012).

From the data obtained and the corresponding analyzes, it can be concluded that the mammal community is widely dominated, in terms of abundance, by the crab-eating fox (*Cerdocyon thous*) in all the analyzed plant formations, with a co-dominance with the collared peccary (*Pecari tajacu*), and crab-eating racoon (*Procyon cancrivorus*) when it comes to plant formations associated with water. In forested areas, however, higher species richness and an almost exclusive presence of felines and primates were regularly found. In open areas (savannas and implanted pastures), the mammal community was also dominated by the bush fox; however, it was found that these areas are widely used by armadillos (*Euphractus sexcinctus*, *Dasyus novemcinctus* and *Cabassus unicinctus*) and anteaters (*Myrmecophaga tridactyla* and *Tamandua tetradactyla*). These species especially take advantage of the almost ubiquitous presence of the takuru in open areas. In the case of anteaters, they use open areas mainly for feeding; but, on the other hand, armadillos also use these areas to make burrows, which can be found in abundance both in implanted pastures and in high and flooded savannas. Other mammals also use open areas, such as deer, peccaries, and felines. However, in the case of felines (puma, ocelot, jaguarundi, etc.), all the records were obtained near waterways or forests with seasonal lagoons, which allows us to establish the hypothesis that they would have a marked preference through wooded and open areas near riparian forests or tall forests.

Among the species mentioned by the people interviewed, we can mention the jaguar (*Panthera onca*), the maned wolf (*Chrysocyon brachyurus*), the Pampas deer (*Ozotoceros bezoarticus*) and the otter (*Lontra longicaudis*). These have been included in the list of recorded species considering the high probability of occurrence and the reliability of the testimonies. In the case of the jaguar, five people reported seeing the species in different sites within Parcel properties. The identified site is located within the Zanja Moroti ranch (22°35'49.29"S, 57°2'1.10"W), roughly 100 meters from a watercourse in an area with considerably large forest patches, Trementina (22°44'10.28"S, 56°54'37.43"W) and San Liberato (22 ° 36'46.51 "S, 56 ° 53'18.23" W). Jaguar tracks were found in two of these locations and additionally one of the people who reported the species showed the team a photo of an attack on a calf that meets the specific characteristics of this species. For this reason, *Panthera onca* is considered an indirectly recorded species, until direct photographs were obtained.

It is likely that this species is represented by one or very few individuals in the area, and uses the large patches of forest found on and outside the Parcel properties as a refuge. Likewise, it is possible that its movement is almost exclusively nocturnal between these patches and the riparian forests found in the area, so its probability of detection is very low.

Furthermore, the maned wolf (*aguará guasú*) was also reported by two people at different times in the same area, just north of the Estancia Soledad ranch, bordering the Paso Bravo National Park, additionally, during the dry monitoring activities, a maned wolf footprint was recoded in Santa Teresa. Estancia Soledad also happens to be the same ranch where the howler monkey was recorded. The otter was reported by several people in different areas, but always linked to watercourses; the species was sighted in Santa Teresa and Hermosa by the team members. Both the jaguar and the maned wolf could be flagship species, so it is extremely important that efforts be made to document their presence and monitor the use they make of the territory.

Descriptions of species that could not be fully identified were also received; for example, the "tirika'ï", which refers to a cat of the genus *Leopardus*, which based on

distributions and citations could be either *L. guttulus* (Nascimento & Feijó, 2017) or *L. geoffroyi* (Cuyckens et al., 2015). Both species are cited for the area in other data collections for fauna, but there is no documentation to support these records. The mention of this record deserves attention because both possible species are included in Appendix I of CITES and, furthermore, *L. guttulus* is categorized as Vulnerable at both national and international levels. Other probable species of conservation interest, such as the giant armadillo (*Priodontes maximus*) and the bush dog or jagua yvyvy (*Speothos venaticus*), were not recorded, neither directly nor indirectly through interviews. These three species fall under some category of national and international threat, and could be flagship species if their presence were confirmed in the area. A number of other species are cited for the area, but these were not detected during the surveys carried out during this first fieldwork campaign; these are, for the most part, marsupials, bats, and rodents. This is because the methodology and the sampling effort were mainly focused on medium and large mammals. Among the recorded species, six have been identified as being of special interest for conservation. Ecological aspects are briefly described for each, following Parera (2017) and Canevari & Vaccaro (2007), meanwhile their current conservation situations and main threats are based on IUCN (2021) and APM & SEAM (2017). These species are the jaguar (*Panthera onca*), the ocelot (*Leopardus pardalis*), the maned wolf (*Chrysocyon brachyurus*), the anteater or yurumí (*Myrmecophaga tridactyla*), the tapir or mborevi (*Tapirus terrestris*) and the white-lipped peccary or tañycati (*Tayassu pecari*). A summary of each of these six species is included in the [Mammalogy](#).

The effort especially aimed at bats, allowed to know more about this community since there is no published inventory in the study area; however, according to the work carried out to date (López - González et al., 1998; Gorresen & Willig, 2004; López-González, 2004, 2005; de la Sancha et al., 2017), it is estimated that there would be 33 Chiroptera species. Through the indirect methodology there were records of species, mostly insectivores, as highlighted in the literature regarding this guild with respect to the echolocation system and they can be more easily detected by acoustic recorders; in addition, a fish-eating species could be recorded with this method. Likewise, foraging activities could be identified in all sampling sites, which demonstrates their importance as a source of food resources for bat species. Vocalizations of bats that were not identified by the software or confirmed by the literature were documented as sonotypes.

Sonotypes are those vocal signatures that cannot be recognized, but are clearly different and can be grouped into different families and genera (Ochoa et al. 2000). The probability of other species present, even unrecorded for the area, is very high, so the development of more studies in the area should be taken into account and the two techniques used in this work (direct and indirect) must be combined. In Paraguay, knowledge about bats is incipient and scarce, so the work carried out with this group of mammals (such as the present study) is of utmost importance and yields novelties such as new records for the area, in this case that of *Saccopteryx leptura*, of the Emballonuridae family. This species, although it is listed by the IUCN as of Least Concern (<https://www.iucnredlist.org/species/19807/22005807>), reaches the limit of its distribution in Paraguay, and in the Red Book of Paraguay (Red Book of Mammals of Paraguay, 2017), is cataloged as DD; that is to say, of concern about the information gaps on the species. The other species registered (by the bioacoustic method) of the Emballonuridae family, *Peropteryx macrotis*, is also recorded for the IUCN as of Least Concern (<https://www.iucnredlist.org/species/16709/22101100>), but in the Paraguay

Data Book of Paraguay (Libro Rojo del Paraguay, 2017), is classified as vulnerable (VU), because it has an extremely restricted distribution and few records of it are known in the country. Additionally, there are no updated records of this species in Paraguay.

The presence recorded of Phyllostomidae bats (*Carollia perspicillata*, *Artibeus lituratus*, *Artibeus planirostris*, *Glossophaga soricina*, *Platyrrhinus lineatus*) considered regenerators of secondary forests (because they disperse seeds and pollinate flowers of pioneer plant species in forests) (Gorresen & Willig, 2004), reveal a good ecosystem health of the study area that allows the recovery of the system in the medium and long term. In general, the results obtained are relevant for the sampling areas, since it allowed the registration of most of the species described for the area, belonging to five different families of the six present in the country (Phyllostomidae, Vespertilionidae, Molossidae, Emballonuridae and Noctilionidae). Regarding the richness of species, this is satisfactory, taking into account the sampling nights and the limitations when choosing the sampling points. It is estimated that species richness and novelties could increase as more areas are sampled and sampling repetitions increase, especially those far from the properties' headquarters, where there are native forests with different levels of degradation.

The innovative eDNA³ developed by Paracel in its preliminary finding adds a species which has not been referenced or recorded during the survey and this is the Naked-tailed Armadillo (*Cabassous chacoensis*), which once the full report is obtained, should be incorporated into the final list of mammal species. It should be noted that it was recorded within the baseline for the pulp mill, yet it is a new species for the plantation AoI. The other four species of global conservation concern have been already identified in the field surveys, except for the confirmation of the Neotropical Otter (*Lontra longicaudis*); while the Turquoise-fronted Amazon (*Amazona aestiva*), the Greater Rhea (*Rhea americana*) and the Black-and-gold Howler Monkey (*Alouatta caraya*) have their presence confirmed by the conventional methods. For the species of fish, the most abundant sequence for *Pimelodella* sp., is to be contrasted with the three species identified in this study, while *Hoplias* sp the most commonly detected species may be contrasted with *Hoplias misionera*. The final report will elucidate information on information for 195 fish, 30 amphibians, 78 birds, 50 mammals and 4 reptiles. In total, eDNA study included eight species categorised on the IUCN Red List: turquoise-fronted Amazon (NT, *Amazona aestiva*), greater rhea (NT, *Rhea americana*), Neotropical otter (NT, *Lontra longicaudis*), Chacoan naked-tailed armadillo (NT, *Cabassous chacoensis*), and black-and-gold howler monkey (NT, *Alouatta caraya*), White-lipped peccary (VU, *Tayassu pecari*), South American tapir (VU, *Tapirus terrestris*), and Giant anteater (VU, *Myrmecophaga tridactyla*).

Although fungi were not the main focus of this study, the presence of specialists was used to identify some specimens found. The description of the genera cataloged in this short survey showed that the number of species can be much higher, especially in the Riparian Forest (BR). Although the Cerradón species are of great importance, they are minor in occurrence. Fungi are natural bioindicators, which is why the occurrence of fungal species is associated with plant species. The mutualistic natural interactions between living organisms in forests are of vital importance, since some plants depend on these interactions for their existence. A larger and exhaustive sampling of fungal

³ NatureMetrics (2021)

species is highly recommended to obtain more data on the fungus / plant coexistence and for the preservation of suitable environments for both types of organisms. With a larger and representative sampling, which covers all the identified plant formations, it will be possible to know the mycobiota in an integral way and thus study its interaction and importance, whether ecological or even for the use of resources in sustainable development.

6.1.7 Conclusions – Flora, Fauna and eDNA

The study area was found with moderate to high anthropic disturbance; nevertheless, the first campaign of a rapid seasonal survey (rainy season) of the fauna and flora was carried out, fulfilling the objective of providing the first records for the resulting baseline and for future evaluations.

The 700 species of plants and 438 species of vertebrates recorded (besides the 40 species of fungi and other species of invertebrates) reflect the great potential of this site for conserving elements of the *Cerrado*, as well as other ecoregions that converge at this point, such as the Atlantic Forest and the Lower Chaco (Humid Chaco). Out of flora and fauna taxa, the diversity of fungi and invertebrates is still far from being known.

This study made it possible to survey and classify the vegetation formations of one of the most threatened, and yet lesser-known ecoregions at the country and global levels. The current knowledge of its biodiversity is based mainly on very old studies, dating back more than 100 years. The most recent studies date back from over the last three decades, mainly carried out applying the REA methodology and other floristic studies of specific taxa. This work reviews these studies and contributes towards the species expected to be found.

Although the *Cerrado* formations are present in the country as isolated mosaics within various ecoregions such as Alto Paraná, Amambay and mainly Aquidabán in the Eastern Region, as well as the *Cerrado* ecoregion in the Western Region, many typical species are common among them, while others are exclusive.

In spite of recent studies and publications that refer to the presence of various endemisms (Pena-Chocarro & De Egea 2018) as well as plant genetic resources (De Egea et al. 2018) of importance for food and agriculture -aspects of great importance and relevance worldwide- a more detailed analysis is required that falls outside the scope of this biodiversity baseline. The same applies to the fauna discussed throughout the different sections.

The study area is considered one of the hot spots of the dendroflora of Paraguay by Spichiger et al. (1995), for constituting the meeting point between two different Floras, that of the *Cerrado* and that of south-east and south Brazil (Flora of the *Cerrado* and Flora Paranaense). Indeed, from a comparative analysis carried out with the 228 tree species that these authors mention as typical of these Floras, it was found that 59 of them (25.9%) are present in the study area. Of these, 37.3% are common to the Pleistocene Residual Dry Seasonal Flora, 26.3% to the Paranaense Flora, 5.5% to the Dry Chaco Flora, 16.7% to the Humid Chaco Flora and 29, 5% to the Flora of the *Cerrado*.

Eighty-one species of fish were found corresponding to 27 families within five orders and one class. The most abundant species was *Odontostilbe pequirá* for the seven sites

(properties), followed by *Corydoras aeneus* and *Moenkhausia dichroua*. Only two species are of conservation concern, *Potamorhaphis eigenmanni* (VU) and *Odontostilbe pequirá* (LC). These findings are considered most relevant for the area and their unprecedented characteristic contributes to the knowledge of the fauna of these underexplored areas. Their association with water and ecosystem health makes these fish key elements to monitor.

In addition, they constitute the highest biomass compared to other vertebrates in some environments (U.S. EPA 2002). Depending on the scale at which they are studied, amphibians can be good indicators of the condition of natural systems (Heyer et al. 1994), given that they use several ecosystems during their life cycle. Consequently, their monitoring is recommended, in particular within ecosystems that are threatened or subject to activities that alter the landscape, such as its structure and the use of agrochemicals (pesticides).

Within this statement fish are also incorporated, due to their relationship with the aquatic environment as indicated. Although the dimensions and the high heterogeneity of environments of the study area have not allowed obtaining a complete resolution of the diversity of amphibians and reptiles in the area, the findings were important and suggest more studies in the field, with the addition of passive methods of captures such as fenced pit traps (Corn 1994; Willson & Gibbons 2010).

From the ornithological point of view, despite the fact that the natural communities of the Cerrado that were evaluated were altered, and several areas could not be covered due to situations unrelated to the sampling campaign (insecurity), they still harbored species with several important criteria, when considering this faunal group as a tool to monitor the changes that have occurred and which will occur in the future in the area. The significance of the riparian forests is highlighted, since they were the communities with the greatest richness and abundance of bird species, followed by the floodable savannas with isolated islets made up of woody plants and vines. These results clearly demonstrate the remarkable value of these biological corridors between the different zones, including nearby protected areas, as well as their relevance in terms of the provision of fundamental ecosystem services, such as the provision of water and soil support. The predominance of species of the Psittacidae family (parrots, parakeets and macaws), a group highly sensitive to extraction for illegal trafficking and loss of habitat, in all plant formations suggests that they serve as a refuge and source of food for the species of this family of birds.

The presence of macaws in the area has potential as an ecotourism attraction, which offers a sustainable conservation strategy, as well as an added value to the environmental commitment of the project. The presence of *Crax fasciolata* and *Pipile cumanensis* highlights the importance of forest formations since this species have few current records in Paraguay, especially in the Eastern Region. For this reason, it is essential to pay special attention to this species within these plant formations. Species such as the Greater Rhea (*Rhea americana*), NT at international level and *Seriema cristata*, are two outstanding species dependent of open natural communities such as savannas and cerrado fields, both species are easy to detect when present and could be good indicators of habitat quality given their specific habitat types. Within the less conspicuous grassland and savanna species, the *Sporophila* seedeaters are good indicators as these species are affected by changes in humid grasslands and these species develop seasonal movements because of refuges and food.

All these species are large, striking, and charismatic, qualities that strengthen the potential to be considered flagship species in the study area. The area is home to species of interest with different states of conservation at national and international level, which occur in the Cerrado, in addition to the species that use this area as a stopping point within their regional migratory routes, which makes them potentially indicator species for implement measures and strategies that make the undertaking's environmental commitment visible.

The species richness of mammals observed during this work is satisfactory taking into consideration the number of days of sampling and methodological limitations (risk of theft of camera traps, for example). Nevertheless, the fact that evidence of unidentified species was found means that additional sampling methods should be used to increase the list of species, specifically for the smaller mammal species (bats, rodents and marsupials) by employing the use of traps and acoustic methods. Furthermore, it highlights the need to increase the sampling effort in areas where species of high importance could be detected and documented, such as the jaguar, the maned wolf, the pampas deer, the giant armadillo and the bush dog, among others. The records of unidentified tracks and the record of the pantanal cat confirm how poorly studied the area is. Based on these results, the technical team expects more surprises and estimates that species richness will continue to increase as more sites are sampled or more replications are carried out.

Furthermore, the records of species of interest for conservation such as the jaguar, the maned wolf, the tapir, the giant anteater, the ocelot and the white-lipped peccary, highlight the importance of the area, and these species should be the focus of conservation and research efforts. All are charismatic species, relatively easy to monitor and have great ecological value within the fauna communities, as well as being representative species of the region.

The project could be viable and compatible with the conservation of biodiversity, considering criteria such as: avoiding the elimination / degradation of native forests, avoiding planting in springs, riparian strips, wetlands and seasonally flooded areas, maintaining biological corridors and buffer strips, restricting and controlling hunting, wildlife capture or harassment; and complemented with a program for fire prevention and biodiversity monitoring.

6.1.8 Ecosystem Services

Ecosystem services are the benefits that people, including businesses, derive from ecosystems (IFC Performance Standard 6). There are four types of ecosystem services (IFC, 2012): (i) provisioning services, which are the products that people obtain from ecosystems; (ii) regulation services, which are the benefits that people obtain from the regulation of ecosystem processes; (iii) cultural services, which are the non-material benefits that people obtain from ecosystems, and (iv) support services.

For this study, provisioning, culture and regulation are considered.

6.1.8.1 Provisioning Services

The main ecosystem services linked to the provision of communities is the use of water for food, consumption of wells, lakes and springs.

It is common in the DIA to practice fishing, both for sale and for self-consumption (for example, the towns of Paso Barreto, Paso Mbutu, Islería). In Direct Influence Area (DIA), from the 64 sampled fish species, ten species are used as subsistence fishing, while nine are used in commercial fishing and 23 are used for ornamental purposes, according to the following table.

Table 23 – Usage of recorded species in different fishing practices.

N	Scientific names	Subsistence	Commercial	Ornamental
1	<i>Acestrorhynchus pantaneiro</i>	X	X	
2	<i>Serrasalmus marginatus</i>	X	X	
3	<i>Parodon nasus</i>			X
4	<i>Megaleporinus obtusidens</i>	X	X	
5	<i>Steindachnerina brevipinna</i>			X
6	<i>Potamorhina squamoralevis</i>	X		
7	<i>Hoplias misionera</i>	X	X	
8	<i>Pyrrhulina australis</i>			
9	<i>Triportheus pantanensis</i>			X
10	<i>Charax leticiae</i>			
11	<i>Astyanax lacustris</i>			X
12	<i>Astyanax lineatus</i>			X
13	<i>Psellogrammus kennedyi</i>			
14	<i>Hemigrammus ulreyi</i>			X
15	<i>Bryconamericus exodon</i>			X
16	<i>Moenkhausia dichroura</i>			X
17	<i>Moenkhausia bonita</i>			X
18	<i>Moenkhausia sanctaefilomenae</i>			X
19	<i>Odontostilbe pequirá</i>			X
20	<i>Gymnocorymbus ternetzi</i>			X
21	<i>Poptella paraguayensis</i>			
22	<i>Tetragonopterus argenteus</i>			
23	<i>Hyphessobrycon eques</i>			X
24	<i>Aphyocharax anisitsi</i>			X
25	<i>Aphyocharax rathbuni</i>			X
26	<i>Characidium</i> sp.			
27	<i>Characidium</i> sp.1			
28	<i>Characidium</i> sp.2			
29	<i>Trachelyopterus galeatus</i>			
30	<i>Pterodoras granulatus</i>			
31	<i>Platydoras armatulus</i>			
32	<i>Pimelodella</i> sp.	X	X	
33	<i>Pimelodella</i> sp.1	X	X	
34	<i>Rhamdia</i> sp.	X		
35	<i>Rhamdia quelen</i>	X		
36	<i>Amaralia oviraptor</i>			X
37	<i>Corydoras aurofrenatus</i>			
38	<i>Corydoras aeneus</i>			X
39	<i>Corydoras hastatus</i>			X
40	<i>Ancistrus pirareta</i>			X
41	<i>Rineloricaria aurata</i>			
42	<i>Otocinclus</i> sp.			X
43	<i>Eigenmannia trilineata</i>			
44	<i>Brachyhypopomus gauderio</i>			
45	<i>Gymnotus pantanal</i>		X	

N	Scientific names	Subsistence	Commercial	Ornamental
46	<i>Potamorrhaphis eigenmanni</i>			
47	<i>Bujurquina vittata</i>			X
48	<i>Cichlasoma dimerus</i>			X
49	<i>Crenicichla lepidota</i>			
50	<i>Gymnogeophagus balzanii</i>			X
51	<i>Pseudopimelodus sp.</i>	X		
52	<i>Crenicichla mandelburgeri</i>			
53	<i>Gymnorhamphichthys britskii</i>			
54	<i>Rineloricaria lanceolata</i>			
55	<i>Loricaria sp.</i>			
56	<i>Hypostomus sp.</i>			
57	<i>Pimelodella gracilis</i>		X	
58	<i>Microglanis carlae</i>			
59	<i>Pimelodus maculatus</i>		X	
60	<i>Serrapinnus sp.</i>			
61	<i>Curimatopsis sp.</i>			
62	<i>Bryconops melanurus</i>			
63	<i>Otothyropsis sp.</i>			
64	<i>Paravandellia oxyptera</i>			

According to Natán report, hunting and fishing activities are one of the main sources of food for some indigenous families. The 92, 12% of the country's indigenous communities declare that they practice these activities. It is recognized that since the pre-colonial period, the indigenous people of the region lived in egalitarian societies and did not produce surpluses, the forest provided them with everything they needed for their subsistence. They traveled large areas to collect, hunt and fish, in addition to meeting their needs for clothing and tools. Hence the importance of these activities for people of indigenous communities.

In relation to hunting and fishing, the knowledge and practice of these activities are directly related to food. The communities hunt only edible animals and in the amount that is indispensable for feeding the community and family, avoiding indiscriminate hunting and respecting the fauna's breeding season. The main animals available for hunting within the IIA are armadillo, pig, fish, deer, coati, lizard, bird, turtle, anteater, monkey, capybara, and ostrich.

Seven mammal species of hunting interest can be included in this category. *D. novemcinctus* is considered, together with the limpet, the most tasty and appreciated wild animal meat by hunters (Sigrist, 2012). Similarly, *Dasyprocta sp.*; *H. hydrochaeris* and *M. gouazoubira* are usually hunted for sport or as a source of food.

C. thous; *L. pardalis* and *L. tigrinus* are under hunting pressure to obtain and market their skins.

In addition, the existing drinking water supply systems are supplied by groundwater, and, as for the communities that still do not have access to drinking water systems, the majority are supplied from deep wells, springs, cutwaters, rivers and streams.

Still in the context of water resources, wetlands are important ecosystems, protected by the Ramsar Convention, a Convention on Wetlands of International Importance, which is an intergovernmental treaty that provides the framework for national action and

international cooperation for the conservation and sustainable use of wetlands and their resources (WCRP, 2014). The characteristics of the natural resources of the Río de la Plata Basin indicate that the wetlands represent the main ecosystems of the region (WCPI, 2014).

These wetland areas are recognized as highly productive ecosystems and one of the most obvious indicators of their wealth and diversity are the wetland birds; these birds constitute a natural resource of great intrinsic human and ecological value, throughout history they have appeared prominently in human culture, as a source of food or ornamentation as well as in the folkloric sense (PMIC, 2014).

These ecosystems perform extremely important functions such as: water reserve and purification, flood buffering, carbon sinks, sediment, organic matter and nutrient storage and/or export sites. In addition, they play a critical role in the life cycle of numerous species of fauna and flora and support trophic chains of adjacent ecosystems (WCPI, 2014).

Other than that, although regarding vegetation cover, it is noteworthy that the area is partly affected by anthropogenic occupations and economic activities already consolidated in the region. The forests are important because they provide ecosystem services also for the whole community in the influence area, providing them with timber (used for house construction), fauna (for subsistence hunting), flora (for food and traditional medicine), and harvested foods such as honey and fruit. The activities of gathering wild fruits are carried out by the indigenous families of the communities to provide themselves with food sources at different times of the year to complement their diet. In the country, 88.6% of indigenous communities declare that they practice gathering food from the forest, field or other places. The main sources of collection in the area are wild honey, coconut, guavira, yvaviju, pakuri and beans.

6.1.8.2 Cultural Services

During field surveys, in perception studies, many people have expressed the use of water resources for recreation/recreation (bathing, beach, fishing), highlighting the Aquidabán river.

Livelihoods are the capabilities, assets (which include both material and social resources) and activities necessary to earn a living (Ashley & Carney, 1999). In indigenous peoples there is usually a vision of interaction and coexistence with forests, biodiversity and ecosystem services. In this sense, the productive activities of subsistence of the communities cannot be separated from the conservation of the forests, since their protection is interdependent on the well-being of the communities.

The manufacture of handicrafts is a cultural and economic activity for many communities. In the country, 75.2% of indigenous communities declare that they dedicate themselves to this activity, with a greater participation of women, which represent 68.2% of indigenous artisans. Although the manufacture of handicrafts is considered as underdeveloped compared to the activities of agriculture, livestock, gathering, hunting and fishing in the area, it is an activity of interest to artisans that not only provides them with income, but is also a source of leisure that contributes to their overall well-being. The raw materials that are usually used for the manufacture of indigenous crafts in the departments of Concepción, San Pedro and Amambay are karaguata, takuara, seeds, wool, guembepi, karanday, feathers and soft woods.

Most of the population alternates agriculture and livestock with the production of handicrafts; These populations have always lived in conditions of extreme poverty with little support from the government and from organizations that channel their productive work towards the achievement of their needs and interests. Many of the artisan trades and their products have disappeared and consumption has drastically decreased as a result of the processes of migration and rural depopulation.

Traditional medicine activities are a constitutive element of the identity of indigenous communities, as it is linked, on the one hand, to the relation between health and disease and, on the other hand, to their worldview and magical, religious and empirical knowledge. For the practice of traditional medicine, indigenous people collect medicinal plants from their environment, known as pohã ñana, and perform prayers, songs and dances. In most cases tobacco is used as a primary plant for healing rituals carried out by spiritual leaders.

6.1.8.3 Regulating Services

For the care of the environment, the project will be governed by national regulations (water and effluent quality standards, zero deforestation, among others). With the highest international standards, which require permanent monitoring of environmental impacts, and the public dissemination of the results.

6.1.9 Land Cover and Land Use

Vegetation cover and PS 6 Type in Forestry DIA is divided in 5 classes type: native forest, riverside forest, Savanna/Floodable/Cerrado area, Grassland/Pasture/Agriculture area and Forest plantations. The percentage of vegetation cover in DIA is presented at the table and figure below:

Table 24 – Vegetation cover and PS 6 Type in Forestry DIA

Class ID	Class type	Area (ha)	%	Area (ha)	%
1	Native forest	52697.11	28.5%	144,487.26	78.14%
2	Riverside forest	8642.29	4.67%		
3	Savanna/Floodable/Cerrado	83147.86	44.97%		
4	Grassland/Pasture/Agriculture	31324.74	26.94%	40,429.79	21.86%
5	Forest plantations	9105.05	4.92%		
Total		184,917.05	100%	184,917.05	

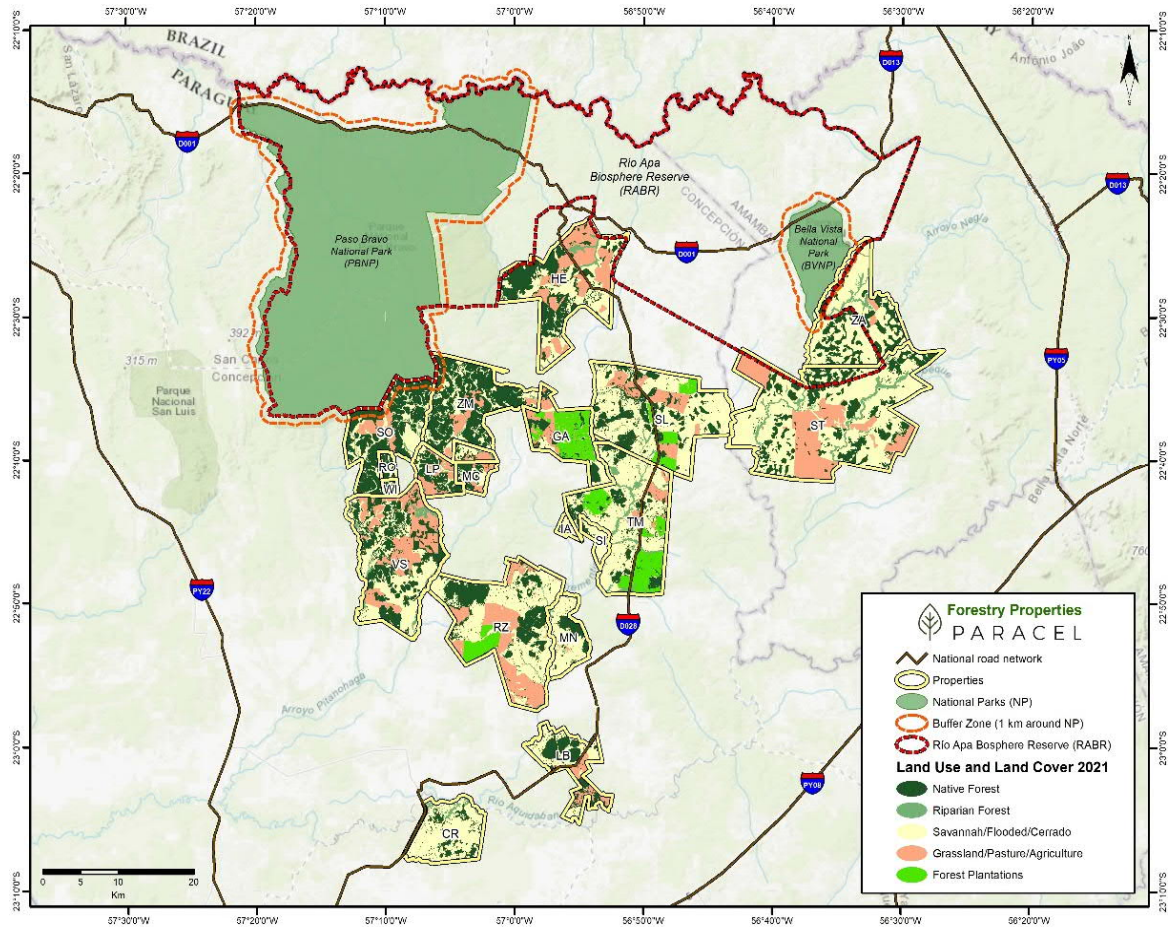


Figure 86 – Defined Land Use and Land Cover by Parcel

Noting that **modified land** consists of heterogeneous landscape consisting of cattle grazing, farming and other anthropological uses, as well as, undisturbed and degraded natural pasture types.

Modified land cover types includes: Pasture implanted with African grasses, manmade (areas, structure, and pavement not including roads), cleared areas, agriculture, agroforestry plantations, and roads. Potential natural land cover types of the pasture complex include wet grasses, and “clean” and “dirty” savannah, referring to the amount of woody stem vegetation. Both savannah types in the pasture complex are represented by a undisturbed and degraded forms. **Forest/Wetland** land cover consists of subhumid forests, riparian gallery forests, fragmented forests (which includes “Cerradon” open dry forests), and seasonal and herbaceous wetlands. Thus, the Potential Natural Land and confirmed Modified Habitat of Parcel’s Forestry Plantations percentage area is presented at the table and figure below:

Table 25 – Potential Natural Land and Modified Habitat of Forestry Plantations

PS 6 Type	Total		Area (ha)	Percentage
Potential Natural	144,487.26	Avoided/Conserved	82,513.48	44.62%
		Planted	61,973.78	33.51%
Modified	40,429.79	Restored	3,536.01	1.91%
		Planted	36,893.78	19.95%
Total	184,917.05		184,917.05	100%

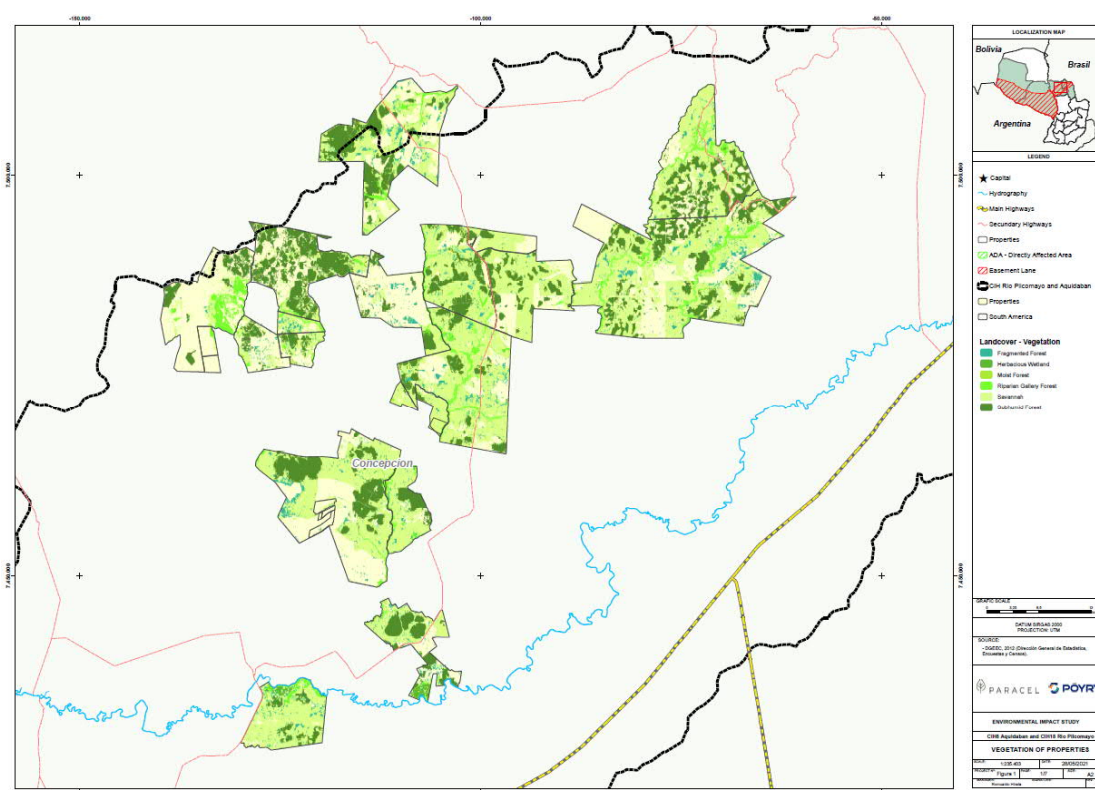


Figure 87 – Potential Natural Land and Modified Habitat of Forestry Plantations.
Source: SINASIP: Paraguay National System of Protected Areas.

The Vegetation and Lan Use Properties Maps od PARACEL area are presented in ANNEX III.

In order to mitigate the forest plantation, Paracel defined criteria for establishing conservation vs planted areas, as showed at the table and figure below:

Table 26 – Paracel criteria for establishing conservation vs planted areas

Forest Management	Criteria
1km PNBV	Buffer area with a distance of 1 kilometer around the National Parks adjacent to the properties, where Paracel will not voluntarily make

1km PNPB	changes in the current use of the land, as a protection measure in the zone that continues to the protected area.
Biological Corridor	Area where Eucalyptus plantations will not be carried out. They do not correspond to areas of environmental liabilities, but will be conserved in its natural state or in confinement as a natural corridor area between the forest masses.
Non-plantable area	Area that includes areas of native forest, protective forests of water courses, or soils not suitable for planting (rocky, low flood zones, etc.)
Recomposition/Confinement	Areas of liability that must be restored (confined or recomposed) both by: 1) Zero Deforestation Law 6676/20 (a satellite image from 2005 was used); 2) Forest Law 422/73 (a satellite image from 1986 was used) and; 3) Law 4241/10 of Protective Forests of Water Channels (a buffer of 100 m was used on both sides of the water channels visualized in the current satellite image and the database of the National cartography of the National Institute of Statistics of the year 2012) .
Plantable area	Area available for Eucalyptus plantations without restrictions in environmental legislation. With the clarification that these are "potential" areas where prior soil analysis and on-site verification must be carried out to accurately determine their aptitude for planting.
RBRA - Río Apa Biosphere Reserve	<p>In the areas where the RBRA overlaps with Paracel's properties, resolution 200/2001 was taken into account in its Art. 31 regarding biosphere reserves.</p> <p>Art. 31 The following are characteristics of the areas with the Biosphere Reserve management category:</p> <ul style="list-style-type: none"> a) The property (s) on which the area is based may be public or private property, as well as those in the municipal public or private domain. b) Production must be carried out through environmentally compatible systems, promoting sustainable production; c) Possess at least 50% of the surface with minimal anthropic alterations, or in natural conditions. d) Carrying out activities aimed at maintaining Environmental Services; e) Carrying out activities aimed at the restoration of ecosystems; Y f) The administration of the area will be exercised by the Enforcement Authority.

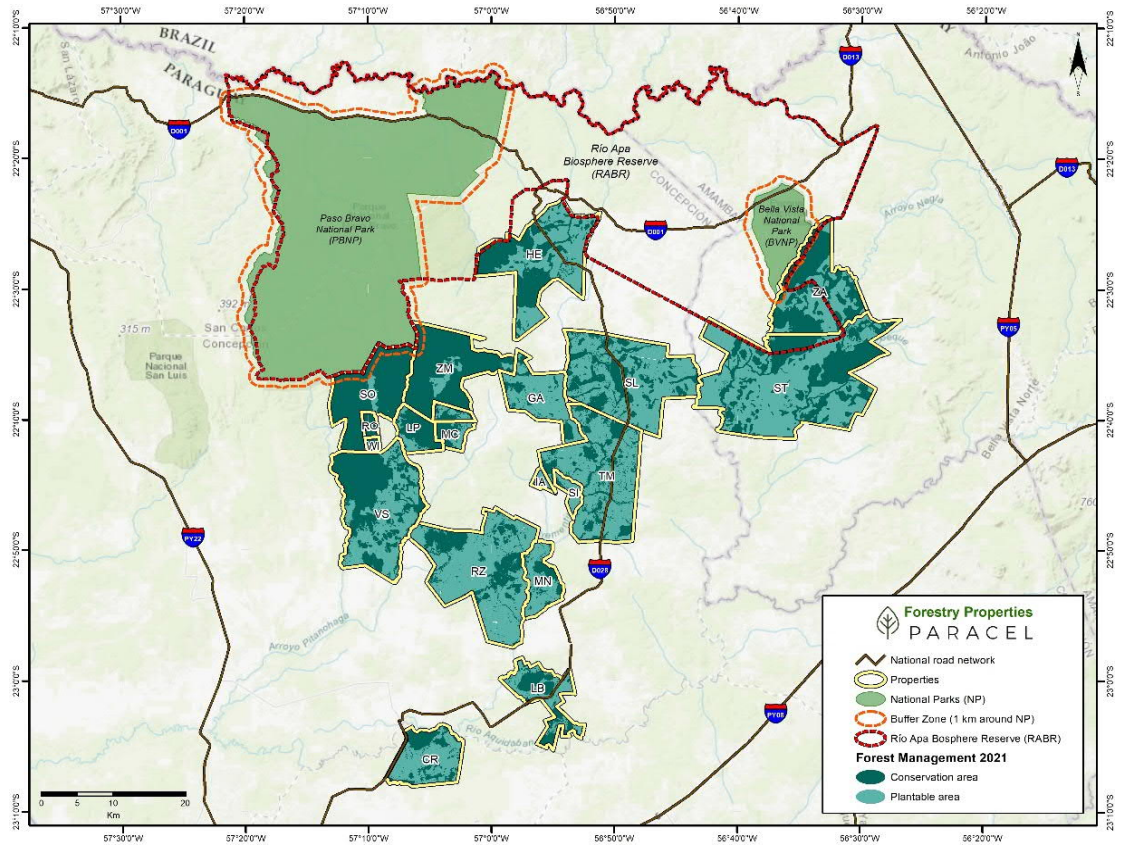


Figure 88 – Estimate Conserved vs Plantable area for Eucalyptus.

The overall calculation on potential natural and modified habitats within Parcel's plantation farms was made based on each property percentage land use presented on **ANNEX IV**.

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ANNEX I
BIOTIC BASELINE FINAL REPORT (CSI)



UNIDAD AGUA, AMBIENTE Y TERRITORIO



PARACEL

**BIODIVERSITY BASELINE STUDY OF PARACEL
PROPERTIES**

FINAL REPORT

MAY 2021



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GENERAL DATA

■ Recommended quote:

CSI Ingenieros. 2021. Biodiversity Baseline Study of Paracel Properties. Paracel S.A. 152pp. (86 pp + annexes)

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Floodable savanna¹, *Discocactus hartmanii*², *Platyrrhinus lineatus*³, *Crax fasciola*⁴, *Amanita* sp.⁵, *Melanophryniscus fulvogutattus*⁶, *Moenkhausia dichroua*⁷, *Nothome erota*⁸ (Photo credits: L. González Soria 1, 2, 5, 8; N. Cantero 3, 4; D. Bueno 6, J. Hemhart 7)

LIST OF ABBREVIATIONS AND ACRONYMS

AA	Wetland Environment (river, stream, reservoir)
BA	Degraded Tall Forest
BR	Riparian Forest
CA	Casual Sightings
CC	Campo Cerrado
CD	Cerradón
CITES	Convention on International Trade in Endangered Species
CR	Conservation Status: Critically Endangered
CS	Campo sucio (Dirty Fields)
DD	Conservation Status: Data Deficient
EA	Ranch
EM	Sampling Site
EER	Rapid Ecological Assessment (RAP)
MADES	Ministry of the Environment and Sustainable Development
NT	Conservation Status: Near Threatened
PN	National Park
PO	Observation Point
RN	Nature Reserve
SA	High Savanna
SI	Floodable Savanna
Sin	Flooded Savanna
UICN	International Union for the Conservation of Nature
VA	Aquatic and Palustrine Vegetation
VU	Conservation Status: Vulnerable

1. INTRODUCTION

The biodiversity baseline study was developed on the properties of PARACEL company, which plans the construction and operation of a pulp manufacturing plant on the Paraguay River, designed based on the best available technologies, and managed by according to certified systems, both from the productive and socio-environmental point of view¹. The raw material (*Eucalyptus* spp.) will come from own plantations located mainly in Concepción Department and to a lesser extent, in Amambay Department. The plantations will be installed in a total of 20 properties (Figure 2–1), on areas that currently correspond to livestock use.

The study area is located within the Districts of Sargento José Félix López in Concepción Department and Bella Vista in Amambay Department, around 500 km from the capital city of Asunción, within the northeastern region of the Department of Concepción and belongs to the Aquidabán ecoregion (Res. SEAM N° 614/13). Seven main sampling areas have been identified: Gavilán, Trementina, Soledad, San Liberato, Santa Teresa, Zapallo and Hermosa). The faunistic monitoring has been carried out systematically and according to a specific monitoring plan; the technical team has carried out a general survey, making it possible to create a list of species for the area as a biodiversity baseline. This information is based on a bibliographic compilation for the potential species to be present in the area and direct observations as a result of field sampling.

The study area is located mainly within the Cerrado ecoregion, which is ranked as Highest Priority at Regional Scale for conservation, based on an analytical system for evaluating the conservation status of the ecoregions (Dinerstein et al. 1995). In Paraguay, the Cerrado occupies relatively small discontinuous areas forming a mosaic pattern on a slightly undulating topography with sandy soils generally visible between the vegetation. It should be noted that, depending on the authors and the context, the Cerrado can be classified as an ecoregion, an ecosystem or a formation. For the purpose of this report, the formation of the Cerrado at a national level is classified under different ecoregions, due to the fact that there is no detailed study of its distribution (Marín et al. 1998, Basualdo & Soria 2002, Rolón et al. 2017).

In the case of this study area, the Cerrado converges with the contiguous Humid Chaco and Upper Paraná Atlantic Forest ecoregions resulting in the presence of a high level of characteristic transitional biodiversity of the main taxonomic groups, and which this study focuses on (plants, fish, amphibians, reptiles, birds and mammals), resulting from the interaction between the ecoregions and their convergence. Knowledge is scarce; however, in spite of this limitation, the region is widely recognized as an area of great importance for fauna due to its remarkable diversity, the presence of species that are either endemic or have a restricted distribution, as well as a considerable number of species that fall under one category of threat or another (Rojas et al., 2020; Critical Ecosystem Partnership Fund, 2017; Asociación Guyra Paraguay, 2004). To further this ecoregional complexity, the area is also influenced by wetlands.

¹ PARACEL. Terms of Reference 200907 PAR-IFC-TOR-BLS biodiversity. Pag. 1

The Paraná-Paraguay river and wetland system acts as a corridor for fauna and flora in a predominantly north-south direction, facilitating the dispersal of organisms from tropical regions to temperate latitudes and from the coastal regions of the Río de la Plata estuary towards the Paraná River and its tributaries (Ringuelet 1975, Giraudo et al. 2004, Arzamendia 2006, Neiff et al. 2006). As a unique characteristic, this region harbors the southernmost distribution of the Cerrado biome, a global diversity hotspot (Myers et al., 2000), reaching into the departments of San Pedro, Canindeyú and Caaguazú in the Eastern region of Paraguay (PNP, 2013; SEAM, 2013).

The study area includes the four types of typical environments found within the Cerrado region; *Bosque Alto* (Tall Forest), *Cerradón*, *Campos Sucios* (Dirty Fields) and *Campos Limpios* (Clean Fields), which have undergone different degrees of alteration mainly as a result of livestock use. Influences from neighboring ecoregions such as the Humid Chaco and the Upper Paraná Atlantic Forest are also evident (Hayes et al. 1995). The presence of Chacoan plant communities is frequently evident by *Copernicia alba* (*karanda'y*) palm groves mixed with typical elements of the Cerrado. Where deeper and more complex soil types are found, tall forests or elements typical of the Upper Paraná Atlantic Forest appear. This mixture of species and landscapes, or rather, this zone of gradual transition results in a local enrichment effect since it creates an opportunity for the convergence and confluence of species that are unique to the individual ecoregions.

Based on the databases from three different sources on the species richness of Paraguay's ichthyofauna, the numbers range from 259 (www.fishbase.org) to 395 (www.faunaparaguay.com/fishlist.html), and up to 451 (www.guyra.org.py). Published studies estimate that there are between 129 (Ramlow, 1981), 189 (Mandelburger et al., 1996) and 298 species (Bertoni, 1939). According to the Koerber & Vera checklist (2017), a total of 307 species of fish were confirmed and listed, four of which are threatened and another four species are introduced exotics. Earlier studies on the ichthyofauna within the study area are scarce and superficial; however, Insaurralde (2012) mentions 37 species for the Aquidabán River, which is relevant considering that the Trementina Stream (*Arroyo Trementina*) is a tributary of this sub-basin. Other water courses of this sub-basin are Negla, Pitano-haga and Napegue. Also, the Hermosa stream was sampled and this flows water northward into the Apa River.

The Apa river basin holds 14,960 km², and in the national territory this basin includes the districts Concepción, San Carlos and San Lázaro (Concepción); in addition to Bella Vista and Pedro Juan Caballero (Paniagua, 2011). This basin involves in the Paraguayan territory several protected areas, some of management categories implemented with private resources, and others are national parks (Paso Bravo National Park; Serranía de San Luis National Park; Bella Vista National Park;s) and Tagatiyami Nature Reserve; Tagatiya Cerrado Nature Reserve, all of these located in the drainage area of the Apa River Basin, which gives it a strong component of sustainability and wealth of environmental tourism, whose production capital has not yet been capitalized in Paraguay, due to lack of infrastructure, access roads, especially, where the "Ojo de Mar" is also located, a natural feature of crystalline water in a geological fracture (Benítez, 2008).

Fish are considered suitable bioindicator organisms as they cover many links in the food chain, are capable of accumulating toxic substances and react easily to low concentrations of mutagenic agents (Minissi et al., 1996; Gustavino et al., 2001).

Around 54 species of amphibians and 91 species of reptiles have been recorded within the study area (Brusquetti & Lavilla 2006, Caballero et al. 2016, Cacciali et al. 2016, Cacciali & Kohler 2018; Smith et al. 2012, Weiler et al. 2013), which represent 61% and 50% of the total number of species for each group present in the country, respectively. In Amambay and Concepción, for instance, there are recorded species of anurans that are not found in any other region of the country, such as *Physalaemus centralis*, *P. marmoratus*, *Leptodactylus furnarius*, *Rhinella scitula*, *Dendropsophus jimi*, *D. elianae*, among others, which suggests this area as an endemic center for anurans in Paraguay (Cabral et al. 2020). Furthermore, although it would seem that the reptiles were simply a sub-set of species from the Atlantic Forest (Cacciali & Ubila, 2016), there are also species exclusive to plant formations of the Cerrado region, such as *Norops meridionalis*, *Colobosaura modesta*, *Salvator duseni*, *Bothrops pauloensis*, among others (Cacciali et al. 2016), which gives the area an exclusive conservation relevance.

There are 464 species of birds that occur within the Cerrado area (65% of the national birdlife), of which 11 species are considered endemic to the Cerrado in Paraguay. Furthermore, a number of species of great importance, either as a result of their ecosystemic role or because of their level of threat in Paraguay, occur in the Cerrado (*Crax fasciolata*, *Pipile cumanensis* g., *Rhea americana*, *Ara chloroptherus*, *Ara ararauna* and *Anodorhynchus hyacinthinus*) (Silva 1997, Guyra Paraguay Sf).

Regarding the mammalian fauna, the study area has few taxonomic studies and systematic surveys throughout the region (Critical Ecosystem Partnership Fund 2017, Red Paraguaya de Conservación en Tierras Privadas, Guyra Paraguay and Conservation International 2008; Guyra Paraguay 2004). Furthermore, most of these surveys were carried out in areas set aside as reserves on private lands, which leaves vast extensions of territory unsurveyed. Some scientific collections exist and some specific scientific work has been carried out where mammal data has been presented for this area (Gamarra de Fox & Martin 1996, Lowen et al. 1996, Melquist 1984); however, most of data compiled on the fauna of the region has resulted from the work carried out during expeditions, casual observations, interviews and Rapid Ecological Assessments for the preparation of technical reports (MAG 1996, Macedo 1996, Altervida 2003, FMB 2004, NLT 2007, Rojas et al. 2020). Rumbo (2010) lists 66 species for the Cerrado in Paraguay, based exclusively on records published in academic articles and museum specimens.

The Guyra Paraguay Biodiversity Database (BDBGP) lists 96 species for the Cerrado (*Campos Cerrados*); this database also includes historical records, data gathered during rapid ecological assessments as well as unpublished observations, always maintaining a strict approach regarding the inclusion of records. Bearing in mind the convergence of other ecoregions, an extensive review of the knowledge regarding the mammalian fauna of the “Northern Block of the BAAPA (Upper Paraná Atlantic Forest)” carried out by Guyra Paraguay (2004) has been consulted, compiling information from more than 20 studies carried out in the region, including the southern part of the area of interest for this study as well as the northern part of the Humid Chaco in the Western Region of Paraguay. In this review, a list of 115 mammal species was compiled based on reliable records for the study area. Once the lists were combined and the taxonomy of the cited species updated, a list of 103 possible species for the study area was obtained, which represents 57% of the country's species.

In Paraguay, 181 species of mammals have been identified (Sancha et al., 2017), of which 24 species fall under some level of threat category at an international level, while 12 species are considered DD (data deficient) (IUCN, 2021). At a national level, 32 species fall under some level of threat category, 29 are considered with insufficient data and 2 are not evaluated (APM & SEAM, 2017).

Among the possible species for this work, some are cited as being of special importance for conservation such as jaguar (*Panthera onca*), giant armadillo (*Priodontes maximus*), giant anteater (*Myrmecophaga tridactyla*), maned wolf (*Chrysocyon brachyurus*), tapir (*Tapirus terrestris*), lipped peccary (*Tayassu pecari*) and pampas deer (*Ozotoceros bezoarticus*). All these species have in common that they are mammals with very specific habitat requirements, are threatened at either a national or international level, are medium or large in size, and can be monitored, using them as "umbrella" or "flag" species to achieve conservation objectives for most of the mammalian communities in the region. In summary, the mammalian fauna of the region is little known, more than 50% of the country's species are listed as possible for the study area, and among these species there are some of special interest for conservation.

Bats, among mammals, stand out for the ecosystem services they provide as seed dispersers, pollinators of different plant species and as controllers of insect pests (Barros et al., 2006; Kunz et al., 2011; Voigt & Kingston, 2016). These ecological functions added to other characteristics such as a wide taxonomic and ecological diversity, an extensive geographical distribution, in addition to the ease of sampling and identification and a high relative abundance, make these mammals a key group to maintain or recover ecosystems and to be bioindicators of the health of an environment (Barros et al., 2006; Medellín & Viquez, 2014; Voigt & Kingston, 2016). Likewise, their low reproductive rate makes them respond quickly to environmental changes since populations can decline abruptly, which allows detecting changes in the ecosystem in the short term (Medellín & Viquez, 2014; Voigt & Kingston, 2016).

Bats constitute the second most diverse order of mammals in the world and the most important group of mammals in neotropical humid forests in terms of numbers of species (approximately 1,400) (López-González, 2005; Simmons & Cirranello, 2020). The importance of bats lies in the fact that they are responsible for the balance of the tropical ecosystem, this can be appreciated and verified by the eating habits of the different species of bats, some are insectivores (the most numerous compared to other bats in the tropical area), frugivores, nectarivores, fish-eaters, hematophages and omnivores. Tropical bats have great potential as indicators of levels of habitat disturbance and offer a broad view of the health of an ecosystem as they exploit different trophic resources (Fenton et al., 1992). In Paraguay, the chiropterofauna is made up of 58 species organized into six families: Mballonuridae (2), Noctilionidae (2), Phyllostomidae (21), Natalidae (1), Vespertilionidae (15) and Molossidae (17) (López-González, 2005; Stevens et al., 2010; Owen et al., 2014; Moratelli et al., 2015). Regarding the trophic guilds, insectivores, omnivores, and hematophagous are present throughout the country, with the exception of *Diaemus youngi* distributed in dry Chaco and in floodplains, and frugivores restricted mainly to the east and floodplains of the country (López-González, 2004; López-González, 2005).

Most of flora and fauna species are monitored through conventional methods, though there are more advanced and recent technologies such as camera traps, bioacoustics and environmental DNA (eDNA) which will be boarded in this study. Camera traps are more widely used for mammal species in Paraguay and bioacoustics for bats is being pioneered in the country. On the other side, eDNA is new for Paraguay. This analysis is organismal DNA that can be found in the environment due to the presence of specimens. Environmental DNA is originated from the cellular material hold by organisms (via skin, saliva, excrement, or other remainders of animal activity) and these released into aquatic or terrestrial environments that can be sampled and monitored using new molecular methods. Such methodology complements the more conventional methods and give information which in many cases is not obtained by traditional methods, especially with cryptic species.

Finally, fungi are eukaryotic, heterotrophic organisms and differ mainly from plants by lacking chlorophyll and by having chitin walls in their cells, apart from storing glycogen as a reserve substance. They are of vital importance for all types of ecosystems due to their role as decomposers, converting organic matter into inorganic so that they can be used by other living organisms. In addition, they form associations with vascular plants, allowing them to resist climate changes, helping to absorb nutrients through hyphal and root associations (Curtis et al. 2000; Wright and Albertó 2002).

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2. METHODOLOGY

General: The proposed methodological intervention focuses on the Rapid Ecological Assessment (REA). The REA methodology integrates multiple levels of biological and ecological information for effective decision-making on conservation, planning, and management (Sayre et al. 2000). It allows to collect, interpret and interrelate, at the office and field level, all the scientific - technical information possible to obtain on the study area in a limited time (Sobrevila & Bath 1992). The information is collected through a process known as stratified sampling, which allows the analysis of data at a gross level or of little detail, thus guiding the collection and analysis of data at a level of greater detail.

For this proposal, as considered relevant, level 2 and level 4 data (from a REA) were applied. At the Level 2: High resolution images, to produce a Vegetation Cover Map. This vegetation cover map made it possible to identify not only the existing ecosystems within the ecoregion(s) but also the identification of natural communities. These landscape units were referenced and quantified in terms of area. And, Level 4: Field work, to produce information on species diversity and habitat quality. As planned, species diversity was measured in terms of specific richness and abundance.

In addition, in order to offer a complete baseline, existing maps and cartographies were used, including a map of ecoregions, changes to land use and deforestation events, a map of priority areas, water resources, edaphic and climatic resources, to offer complete information for decision making.

The basic steps, according to the methodology of a REA include: Definition of objectives, Data acquisition, Data analysis, Analysis verification, Product generation, Recommendations and applications. This analysis allows generating the evidence and demonstrating the routes for obtaining the information so that the same methodology, with or without modifications, could be repeated in the future, thus giving the best possible use to the Baseline Study.

In order to understand the number of species collected and the sampling effort, techniques for accumulation curves and biodiversity indices (Shannon-Weaver and Simpson) were used which are described in each of the taxa.

The biodiversity baseline study was divided in two field campaigns, one during the rainy season carried out from 12th to 22nd December 2020, and from 25th March and 5th April 2021, and another in the dry season, carried out 9 to 20th May 2021 developed early in the dry season. The dates of March 25 as part of the rainy season, such as the beginning of May for the dry season, were carried out according to the requirements of the contractor to complete the biodiversity base sampling. In total, effective field tasks of 10.5 days were carried out in December with four sampling areas (AM), 9.5 days in March with three AMs and 9.5 days of sampling in May in seven AMs areas with a duplicated team working synchronously. This gives a total of 29.5 days of effective field work with an investment of 4.21 days per AM in total for both seasons, or 2.1 days per AM per season.

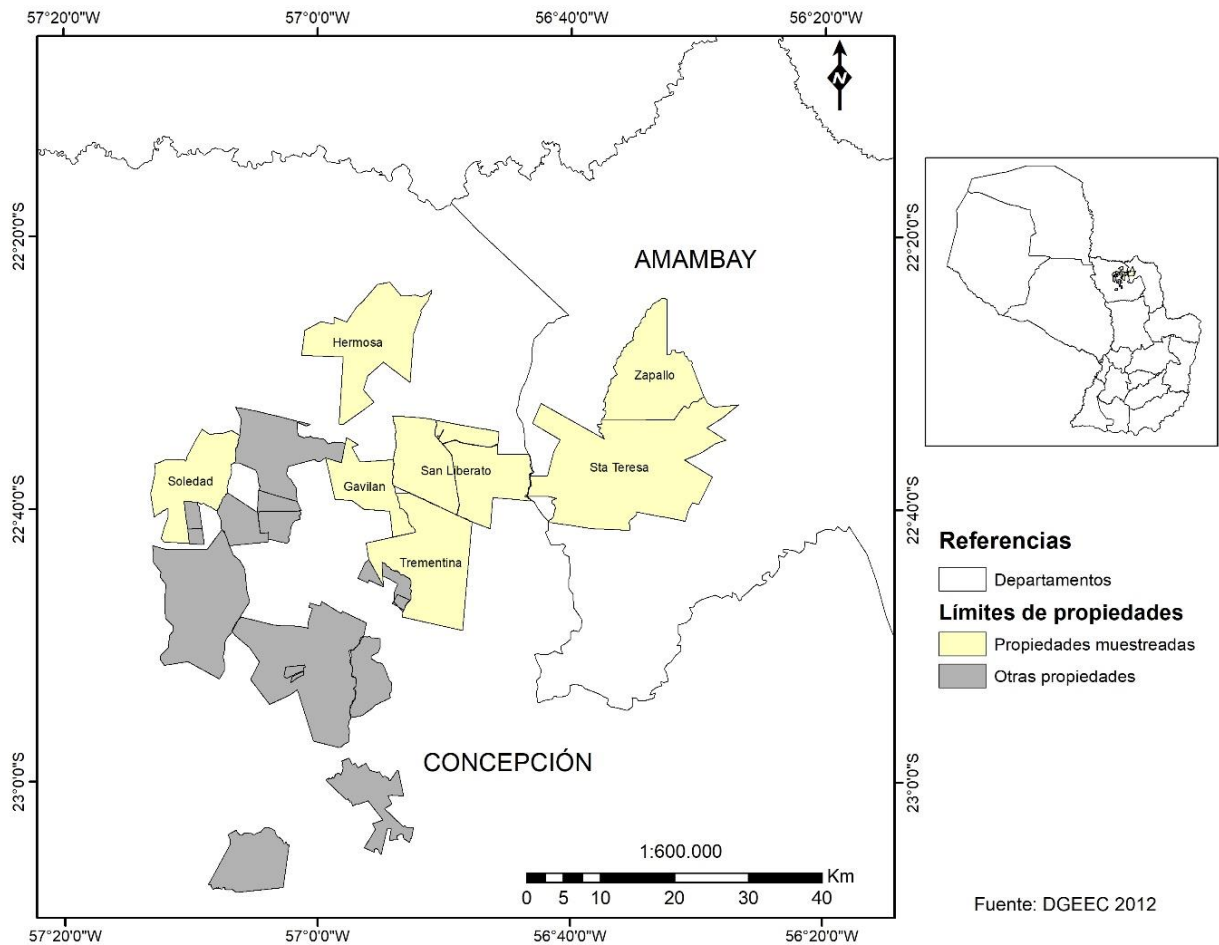
Five workshops for the preparation and selection of sampling areas were carried out using information based on GIS as well as lists of cited species and of possible occurrence at the sites, additionally two workshops more in between the rainy season and the dry season, to plan accordingly and optimize the field campaign. Representative areas were selected based on the criteria of representativeness and convenience.

An extensive bibliographical search was carried out for all taxonomic groups, focusing on those occurring within the departments of Concepción and western Amambay, so as to be prepared for what we could expect to find at the sites, based on possible species records from scientific articles, scientific collections and records from other surveys carried out in neighboring properties as well as in conservation areas.

Meetings were held with professionals from PARACEL and at their invitation with experts from international financial entities, after these meetings the decision was made to expand the first field campaign from December 2020, and to carry out a second sample at the end of the rainy season (March and April), in addition to designing a sampling for chiroptera using modern bioacoustics techniques and environmental DNA sampling in some 190 localities that had water available. These two components, chiropteroфаuna and Environmental DNA, will have separate reports. However, bat sampling and monitoring carried out asynchronously with the team (in April) is integrated in this baseline. A preliminary report on eDNA in the samples is integrated in this report. Additionally, data on other biodiversity species, such as invertebrates and fungi, add information to this baseline report.

The studies were carried out mainly on four properties (*estancias*), which are referred to as sampling areas. These were identified as representative areas of the ecoregions and include all the environmental units previously identified as relevant. The sampling areas are *Soledad*, *Gavilán*, *Trementina* and *San Liberato* (Figure 2–1). Sampling stations, sampling points and transects in all taxonomic groups were associated to the identified plant formations while ichthyofauna was the only group in which complementary stations took place.

Figure 2-1 Map showing sampling areas



In terms of fieldwork, methodologies were carried out according to the type of taxa being studied, applying direct and indirect methods, as well as employing the use of drones to confirm the GIS analysis where necessary. At all times, the sampling sites were guided by the natural communities and a botanical survey (Table 2–1, Figure 2–2). The various specialists worked together, comprehensively, documenting all records thoroughly. Movements between sampling sites were made to secure any relevant record that might enrich the biodiversity baseline (“casual records/sightings”, in the REA methodology); furthermore, night patrols were also carried out in order to increase the probability of finding the more cryptic species. The local inhabitants and ranch personnel were contacted *ad libitum* to inquire about the presence of observed species. The entire team worked with any available digital platforms (@Avenza Maps) taking advantage of these for photographs and geolocations. During monitoring early in the dry season, adjustments in the methodology were done for security reasons in the field which did not affect data collection except for some timetables which will be detailed accordingly.

To determine the degree of threat according to the International Union for Conservation of Nature (IUCN), the website of the Red List was consulted (<https://www.iucnredlist.org/>); meanwhile, the degree of threat at a national level was determined based on the official resolutions of the Ministry of the Environment and Sustainable Development (MADES): Res. MADES N°470/19 for flora, Res. MADES N°433/19 for amphibians, Res. N°254/19 and SEAM N° 632/17 for birds and mammals, and MADES Res. N°206 for reptiles.

To determine whether any species were included in a CITES Appendix, the website of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was consulted (<https://cites.org/esp/disc/species.php>). For the identification of uses, various types of bibliographic sources were consulted, and complemented further based on the knowledge of experts and local inhabitants, as well as observations during fieldwork (in the case of melliferous species and consumption by fauna).

Plants and Vascular Flora. For the characterization of plants and vascular flora (see [List of species with common names and conservation status](#)), a preliminary classification of the plant formations and communities was carried out and the sampling sites were established during deskwork. Data was collected from 34 Sampling Stations (EM) of 50m x 4m for forest formations and 50m x 2m for *campos cerrados*, *campos sucios*, and savannas. Similarly, 25 circular Observation Points (PO) with a 10m radius were set up and complemented with casual sightings (records of relevant/representative species outside EMs and POs). All species sighted in EMs, POs or OCs were identified and recorded in field forms, following Sayre et al. (2002). All fertile specimens were collected (whole herbs and cuttings from subshrubs, shrubs and trees) and deposited in the Herbarium of FACEN / National University of Asunción. Non-fertile specimens were collected in the case of missing determinations. Plant environments and communities were identified and described, specifically recording data on dominant and rare species. Environments and species were also recorded photographically (<https://drive.google.com/drive/folders/1fyBdOR8KgePNILg6s8N9AjKrKzCmZdir?usp=sharing>). The plant formations were characterized following the criteria proposed by Mereles (2007), Prado (2000) and Spichiger et al. (1995). The list provided in the results section contains updated scientific nomenclature, based on internationally accepted databases and specialized publications.

Table 2-1 Summary of Sampling Sites (original names in Spanish remains for comparisons)

N°	Site	Code	Formation/Community	Geographical Coordinates	Altitude (masl)
1	Gavilán	EM1	Floodable Savanna (Unnamed stream) Sabana inundable (Arroyo sin nombre)	22°40'15"; 56°54'00"	138
2	Gavilán	EM2	Degraded Tall Forest (<i>Attalea phalerata</i>) Bosque Alto degradado (<i>Attalea phalerata</i>)	22°40'20,3"; 56°53'44,7"	155
3	Gavilán	EM3	Degraded Tall Forest (<i>Guarea guidonia</i>) Bosque Alto degradado (<i>Guarea guidonia</i>)	22°40'20,3"; 56°53'44,3"	164
4	Gavilán	EM4	Riparian Forest (<i>Salacia elliptica</i>) Bosque ribereño o marginal (<i>Salacia elliptica</i>)	22°40'03,1"; 56°53'44,3"	143
5	Gavilán	EM5	Dirty Field Campo sucio	22°37'37,3"; 56°57'03,5"	182
6	Gavilán	PO1	Floodable Savanna (intersection Eucalyptus plantations) Sabana inundable (Intersección Eucalyptal)	22°39'00"; 56°54'35,5"	148
7	Trementina	EM1	Riparian Forest Bosque ribereño o marginal	22°43'56,1"; 56°51'13,6"	143
8	Trementina	EM2	Riparian Forest (<i>Coussarea platyphylla</i>) Boque ribereño o marginal (<i>Coussarea platyphylla</i>)	22°43'10,8"; 56°52'45,3"	131

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N°	Site	Code	Formation/Community	Geographical Coordinates	Altitude (masl)
9	Trementina	PO2	Aquatic and Palustrine Vegetation Vegetación acuática y palustre	22°43'54,7"; 56°54'31"	153
10	Trementina	PO1	Riparian Forest along drainage ditch Bosque ribereño o marginal en Canal de drenaje	22°43'53,5"; 56°51'12"	136
11	Soledad	EM1	<i>Campo cerrado</i>	22°39'46,7"; 57°12'11,2"	219
12	Soledad	EM2	Riparian Forest Bosque ribereño o marginal	22°39'40,0"; 57°12'04,0"	213
13	Soledad	EM3	Riparian Forest Bosque ribereño o marginal	22°39'52,6"; 57°12'05,3"	213
14	Soledad	EM4	Floodable Savanna Sabana inundable	22°38'31,8"; 57°11'45,4"	231
15	Soledad	EM5	<i>Cerradón</i>	22°36'35,6"; 57°08'59,2"	
16	Soledad	EM6	<i>Cerradón</i>	22°36'24,6"; 57°08'47,1"	263
17	San Liberato	EM1	Riparian Forest (unnamed stream) Bosque ribereño o marginal (Ao sin nombre)	22°40'05,9"; 56°49'40,1"	157
18	San Liberato	EM2	Degraded Tall Forest Bosque Alto Degradado	22°39'17,0"; 56°51'35,1"	215
19	San Liberato	EM3	Degraded Tall Forest Bosque Alto Degradado	22°39'10,4"; 56°51'50,9"	197,43
20	San Liberato	EM4	<i>Cerradón</i> Patches <i>Cerradón</i> en Isla	22°39'09,9"; 56°52'08,0"	193
21	San Liberato	PO1	Unnamed Stream Arroyo sin nombre	22°40'05,9"; 56°49'40,1"	157
22	San Liberato	PO2	Tall Savanna of <i>Elionurus</i> Sabana alta de <i>Elionurus</i>	22°38'57,8"; 56°52'28,6"	177
23	San Liberato	PO3	Floodable Savanna with <i>Copernicia alba</i> Sabana inundable de <i>Copernicia alba</i>	22°38'28,2"; 56°53'36,8"	158
24	San Liberato	PO4	Dirty Field (<i>Anacardium humile</i>) Campo sucio (<i>Anacardium humile</i>)	22°38'09,8"; 56°53'47,2"	146
25	San Liberato	PO5	Forest Patches <i>Tocoyena Formosa</i> Isleta <i>Tocoyena Formosa</i>	22°38'09,8"; 56°53'47,2"	146
26	San Liberato	PO6	<i>Cerradón</i> (white sand) - <i>Dimorphandra mollis</i>	22°36'55,3"; 56°53'27,0"	162
27	San Liberato	PO7	Trementina Gallery Forest - <i>Bactris glaucescens</i>	22°37'54,0"; 56°54'01,2"	142
28	Santa Teresa	EM1ST	Degraded High Forest Bosque Alto Degradado	22°36'17.6"S; 56°33'30,0"W	189
29	Santa Teresa	EM2ST	Degraded High Forest Bosque Alto Degradado	22°36'16.8"S; 56°33'37,3"W	215
30	Santa Teresa	EM3ST	Riparian Forest Bosque ribereño o marginal (Ao Napegue)	22°36'32.0"S; 56°33'08,0"W	174
31	Santa Teresa	EM4ST	Floodable Savanna Sabana inundable	22°36'29.2"S; 56°33'14,6"W	166
32	Santa Teresa	EM5ST	High Savanna Sabana alta	22°35'22.0"S; 56°33'51,0"W	178

N°	Site	Code	Formation/Community	Geographical Coordinates	Altitude (masl)
33	Santa Teresa	EM6ST	Floodable Savanna Sabana inundable	22°38'27.9"S, 56°39'00,8"W	172
34	Santa Teresa	EM7ST	Floodable Savanna Sabana inundable	22°39'39.8"S, 56°37'48,0"W	168
35	Santa Teresa	EM8ST	High Savanna Sabana alta	22°39'25.8"S, 56°41'27,3"W	163
36	Santa Teresa	PO1ST	Forest Edge, degraded area Borde de bosque zona degradada	22°36'20.1"S, 56°33'14,8"W	185
37	Santa Teresa	PO2ST	Riparian Forest Bosque ribereño o marginal (Ao Napegue)	22°36'31.8"S, 56°33'08,8"W	166
38	Santa Teresa	PO3ST	High Savanna Sabana alta	22°36'49.4"S, 56°33'25,5"W	165
39	Zapallo	EM1Z	High Savanna Sabana Alta	22°25'26.2"S, 56°22'48,1"W	202
40	Zapallo	EM2Z	Floodable Savanna Sabana inundable	22°31'33.5"S, 56°32'32,6"W	187
41	Zapallo	EM3Z	Flooded Savanna Sabana inundada (Riacho kuriju)	22°30'24.6"S, 56°30'59,3"W	210
42	Zapallo	EM4Z	Dirty Field Campo sucio	22°31'18.5"S, 56°36'35,5"W	163
43	Zapallo	PO1Z	Riparian Forest Bosque ribereño o marginal (Ao Negla'i)	22°24'37.3"S, 56°32'21,4"W	191
44	Zapallo	PO2Z	Embalsado (Riacho kuriju)	22°30'24.5"S, 56°30'58,2"W	211
45	Zapallo	PO3Z	Cerradón	22°30'22.0"S, 56°31'04,3"W	210
46	Zapallo	PO4Z	Cerradón	22°31'59.4"S, 56°36'15,1"W	183
47	Hermosa	EM1H	Floodable Savanna Sabana inundable	22°28'02.1"S, 56°57'41,8"W	218
48	Hermosa	EM2H	Pastura/Pasture Urochloa brizantha	22°24'35.6"S, 56°55'04,8"W	221
49	Hermosa	EM3H	Cerrado	22°31'13.6"S, 56°56'44,0"W	171
50	Hermosa	EM4H	Pastura/Pasture Urochloa brizantha	22°27'13.3"S, 56°54'58,5"W	215
51	Hermosa	EM5H	Riparian Forest Bosque ribereño o marginal (Ao Trementina)	22°31'17.4"S, 56°56'52,4"W	186
52	Hermosa	PO1H	Riparian Forest Bosque Ribereño Ao. Trementina	22°31'08.2"S, 56°56'28,8"W	
53	Hermosa	PO2H	Pastura/Pasture Urochloa humidicola	22°28'4.2"S, 56°58'06,9"W	187
54	Hermosa	PO3H	Pasture of Urochloa humidicola with forest islands Pastura Urochloa humidicola con isletas de bosque	22°27'39.5"S, 56°57'29,7"W	216

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N°	Site	Code	Formation/Community	Geographical Coordinates	Altitude (masl)
55	Hermosa	PO4H	Forest Islands (100 m around PO) Isletas de bosque (100 metros a la redonda del PO)	22°28'04.2"S, 56°58'06,9"W	216
56	Hermosa	PO5H	High degraded Savanna (Pasture of degraded U. brizantha) Sabana Alta degradada (Pastura U. brizantha degradada)	22°27'03.9"S, 56°54'57,2"W	215
57	Hermosa	PO6H	Riparian Forest Bosque Ribereño Ao. Hermosa	22° 24' 45,1"S, 56°55' 32,2"W	184
58	Hermosa	PO7H	Floodable degraded Savanna (Pasture U. humidicola) Sabana Inundable degradada (Pastura U. humidicola)	22°24'55.8"S, 56°53'52,8"W	187
59	Hermosa	PO8H	Forest Islands (at 100 m PO7H) Isletas de bosque (a 100 m PO7H)	22°24'58.6"S, 56°53'47,7"W	190

EM: Sampling station; PO: observation points

Ichthyofauna. The methodology was replicated in every sampling except for night surveys during the dry season. For the ichthyological survey, active methods were used with cast nets, hand nets and trawling nets as well as manual fishing [Ichthyology \(fish\)](#). At night, cast net and manual fishing techniques were used, in addition to crab and umbrella-type traps, each specimen was photographed and released again employing the catch and release method. At each monitoring point, various combinations of fishing methods were carried out, following a strict procedure: from the marked point three trawls/draws to the left and to the right and ten attempts with the hand net each side, manual fishing (if the site allows) for two hours and several attempts with the cast net. Two umbrella-type traps with eight openings and one of the crab-type traps were also placed on each side, totaling six traps per sampling site. These traps remained in place for approximately 30 hours. For the lentic environments, cast net and manual fishing techniques were employed. Furthermore, the types of aquatic environments were recorded, including dates and coordinates. Eighteen sampling sites (Table 2–2) were surveyed during the days of fieldwork. Ichthyofauna was the only group to include additional sampling sites (Figure 2–2).

Table 2-2 Ichthyological sampling points within the study area

Sampling Sites	Geographical Coordinates	Habitat Classification	Aquatic Environment Type
Point 1 (Ea. Gavilán)	22°40'9.34"S; 56°54'0.39"W	Lotic	Stream
Point 2 (Ea. Gavilán)	22°37'34.79"S; 56°56'57.78"W	Lentic	Reservoir
Point 3 (Ea. Trementina)	22°44'11.00"S; 56°51'36.00"W	Lotic	Stream
Point 4 (Ea. Trementina)	22°44'11.57"S; 56°51'25.49"W	Lentic	Reservoir
Point 5 (Ea. Soledad)	22°36'14.5"S; 57°07'08.9"W	Lotic	Stream
Point 6 (Ea. Soledad)	22°36'30.3"S; 57°06'51.5"W	Lotic	Stream
Point 7 (Ea. Soledad)	22°36'25.0"S; 57°06'29.0"W	Lotic	Stream
Point 8 (Ea. San Liberato)	22°38'20.2"S; 56°53'44.5"W	Lotic	Stream
Point 9 (Ea. San Liberato)	22°37'52.12"S; 56°54'5.29"W	Lotic	Stream

Sampling Sites	Geographical Coordinates	Habitat Classification	Aquatic Environment Type
Point 10 (Santa Teresa)	22°36'26.4"S 56°37'17.5"W	Lotic	Stream
Point 11 (Santa Teresa)	22°36'03,3"S 56°33'04,3"W	Lotic	Stream
Point 12 (Santa Teresa)	22°36'48.0"S 56°40'24,6"W	Lotic	Stream
Point 13 (Santa Teresa)	22°38'37,5"S 56°39'26,6"W	Lotic	Stream
Point 14 (Santa Teresa)	22°38'43,7"S 56°41'16,3"W	Lotic	Stream
Point 15 (Zapallo)	22°29'01,5"S 56°32'42,7"W	Lotic	Stream
Point 16 (Zapallo)	22°29'01,4"S 56°32'52,2"W	Lotic	Stream
Point 17 (Hermosa)	22°24'29,7"S 56°52'31,4"W	Lotic	Stream
Point 18 (Hermosa)	22°24'45,3"S 56°53'33,0"W	Lotic	Stream

Herpetofauna. Two field campaigns were developed as done in the other groups. Both campaigns were developed in a similar way in the sampling sites, when possible, with adjusted timetables due to daylight duration is shorter during the dry season. Active searches were carried out by day and by night over 20 days along sampling transects ranging 200-300-500 meters for each of the associated plant formations identified (Figure 2–2) (See information [Herpethology](#)). A total of 12 transects during the rainy season with four repetitions in each (except in two of them in which three repetitions, and in three of them two repetitions); thus reaching 40 samples in BA (18), CC (4), SA (4), SI (6), BR (8) and CD (2). The searches involved observational walks during times of greatest foraging activity; that is, during the morning until noon (10:00 – 13:00) and in the afternoon just before sunset (16:00 – 19:00). Bearing in mind that amphibian and reptile activity times vary substantially at a specific level, potential shelters for frogs, lizards and snakes -such as under logs, rocks and burrows of other vertebrates- were also inspected during in each walk (Heyer et al. 1994, McDiarmid et al. 2012). A total Of 94 lists over 54 transects ([Herpethology](#)). Random searches were also carried out whenever possible.

During the dry season, the search method was the same with adjusted timetables and less repetitions due to logistic issues. Daylight timetables were 09:30 to 13:00 and later during the day before sunset (15:-17:30). A total of 38 transects were done in the following plant formations: BA (9), CC (1), SI (14), BR (6), CD (2), SA (9), completing in this way 73 lists ([Herpethology](#)). No night sampling was carried out.

During the rainy season, amphibian breeding sites were sampled, which were identified during the day (permanent or temporary bodies of water) and by night employing a random search based on auditory scans. Based on the amphibian behavior of having species-specific advertisement calls, where males call females to breeding sites (Duellman & Trueb 1994, Emerson & Boyd 1999), vocalization recordings were employed to identify and record species, making use of the available sound guides (De la Riva et al. 2000, Haddad et al. 2005, <https://amphibiaweb.org/lists/sound.shtml>) as well as the herpetologist's own database of sound recordings. To confirm the identifications, the vocalizing species were located whenever possible with the aid of a headlamp. Individuals were manipulated either by hand or occasionally with a snake hook or forceps. The following sources were used to consult amphibian taxonomy: Brusquetti & Lavilla (2006), Smith et al. (2012), Weiler et al. (2013), Lavilla & Brusquetti (2018), Magalhaes et al. (2020). In the case of reptile taxonomy, Cacciali et al. (2016), Cacciali & Kohler (2018) were used.

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With the data obtained, the total richness was calculated in the entire study area and also in each sampled plant formation. Accumulation curves were generated in the EstimateS program (Colwell, 2013) of species and Chao1 and Jack 1 estimators used to determine how many more species could possibly be present. To compare the diversity between areas, the Simpson and Shannon indices were calculated with the Past v.4 program (<https://www.nhm.uio.no/english/research/infrastructure/past/>).

Ornithofauna. Bird observations were made at the sampling sites (Figure 2–2) in the six natural communities visited (BR, BA, SI, VA, CC, CD) (see [Ornithology](#)) by recording the number of individuals of each species by means of 72 transects (four per community) found along 150-meter transects within 15-minute intervals. These observations were carried out during the first three hours after dawn, since this is considered the time of day with most bird activity (Blake 1992 and Ralph et al. 1996) (Figure 2–2). Further observations were made during the afternoon (15:00 to 17:30) prior to a decrease in activity of the diurnal birds to further enrich the inventory and increase the sampling effort through these repetitions, completing the survey by means of 303 lists generated by transect, and 54 lists outside the transects by occasional records. Certain species were also recorded through interviews with local inhabitants and with specialists who either visit often or know the area well; although these interviews do not take into consideration the number of individuals for each species, they do contribute to the total species richness for the area. With regards to the materials used for the observations, we can mention a 10 x 42 binocular and the Identification Guide to the Birds of Paraguay (Narosky & Yzurieta 2006). Furthermore, sound databases were used for playback, including Bird Sounds from Southern South America and Xeno-canto (2005), with the purpose of maximizing the possibility of obtaining more records (such as those endemics to the Cerrado or of probable occurrence), as well as for the validation of the vocalizations heard in the field. For the post-processing of the data back in the office, the taxonomic classification was based on Remsen et al. (2020), meanwhile, bird nests were identified with the aid of a guide to the nests of birds in Paraguay (*Guía de Nidos de Aves del Paraguay*; De la Peña 2010), the state of occurrence was based on Guyra Paraguay (2004), and Silva (1997) was used to determine the species endemic to the Cerrado. In order to support the characterization of the records, the CITES database (UNEP-WCMC 2020) was consulted to determine which species are included. Finally, the IUCN Red List (IUCN 2021) was used to determine the threat categories at an international level, and the MADES Resolution No. 254/19 “Updated list of protected wildlife species: Class Aves” was used to determine the threat categories at the national level.

Mammalian Fauna. Both direct and indirect survey methods were employed. For direct data collection, intensive searches were carried out in which all observed mammals and their traces were recorded, including footprints, feces and other signs of presence (See [Mammalogy](#)). The searches were carried out both on foot and with vehicles through the various natural communities identified, both by day and by night based on the most typical activity patterns of mammals. A total of eighty-three sampling units with transects, camera traps and mist nets. A total of 30 sampling stations for twelve camera traps were set up for different periods of times with rotating locations according to the explorations with a total of 114 nights/traps in the different plant communities (Figure 2–2). This was done to increase the probability of detecting cryptic or rare species. Fifty linear transects of 200 meters long and 5 meters wide were surveyed in six of the identified natural communities (BR, BA, SA, SI, CC and CD). According to the temporal and spatial possibilities, repetitions were carried out on different days and in different places for each analyzed formation. Likewise, data from chiropterans were collected through the use of three mist nets located in points near headquarters to facilitate the review and work with them, these networks were opened and revised according to the logistical possibilities, totaling six nights of sampling.

This is for the rainy season; though, in the transition to the dry season a special bat sampling was developed (see below). All the data obtained directly were assigned to the corresponding natural community. Additionally, indirect data were collected through interviews with local workers and residents, first consulting about the names and behaviors of the mammals and then corroborating the identifications with printed photographs or photographs taken by the interviewees.

The statistical analyzes were carried out taking into account only the data obtained in the linear transects and the camera traps. These analyzes included the construction of a species accumulation curve for all samplings, and the calculation of chao1 and jackknife1 richness estimators for each plant community that had more than 10 sample units (BR, BA, SI and SA) (Thompson and Thompson 2010); Likewise, the estimation of the Shannon-weaver and Simpson diversity indices (Magurran 2004) and the construction of range-abundance graphs (Feisinger 2004) for the community in the entire sampled area. All analyzes were performed with the Estimates software (Colwell 2013) and with the R software (R Core Team 2020) using the BiodiversityR package (Kindt and Coe 2005).

Specialized guides were used for the identification of mammals, their footprints and other signals (De Ángelo 2017, Canevari 2007, Villalba & Yanosky 2000). Furthermore, the identification of species according to their category of threat at a national and international level was carried out following the Red Book of Mammals of Paraguay (APM & SEAM 2017, Resolution SEAM N°632/17 “Updated list of protected wildlife species: Class Mammalia”) and the IUCN Red List (IUCN 2021), respectively. The general taxonomy follows Wilson & Reeder (2005) with updates considered by Sancha et al. (2017), but accepting the change proposed by Segura et al. (2013) for the species *Herpailurus yagouaroundi*.

For a better understanding of the field distribution, sampling stations and observation points (EM, PO), ichthyological points and stations (E), as well as location of camera traps (CT) are depicted in Figure 2–2.

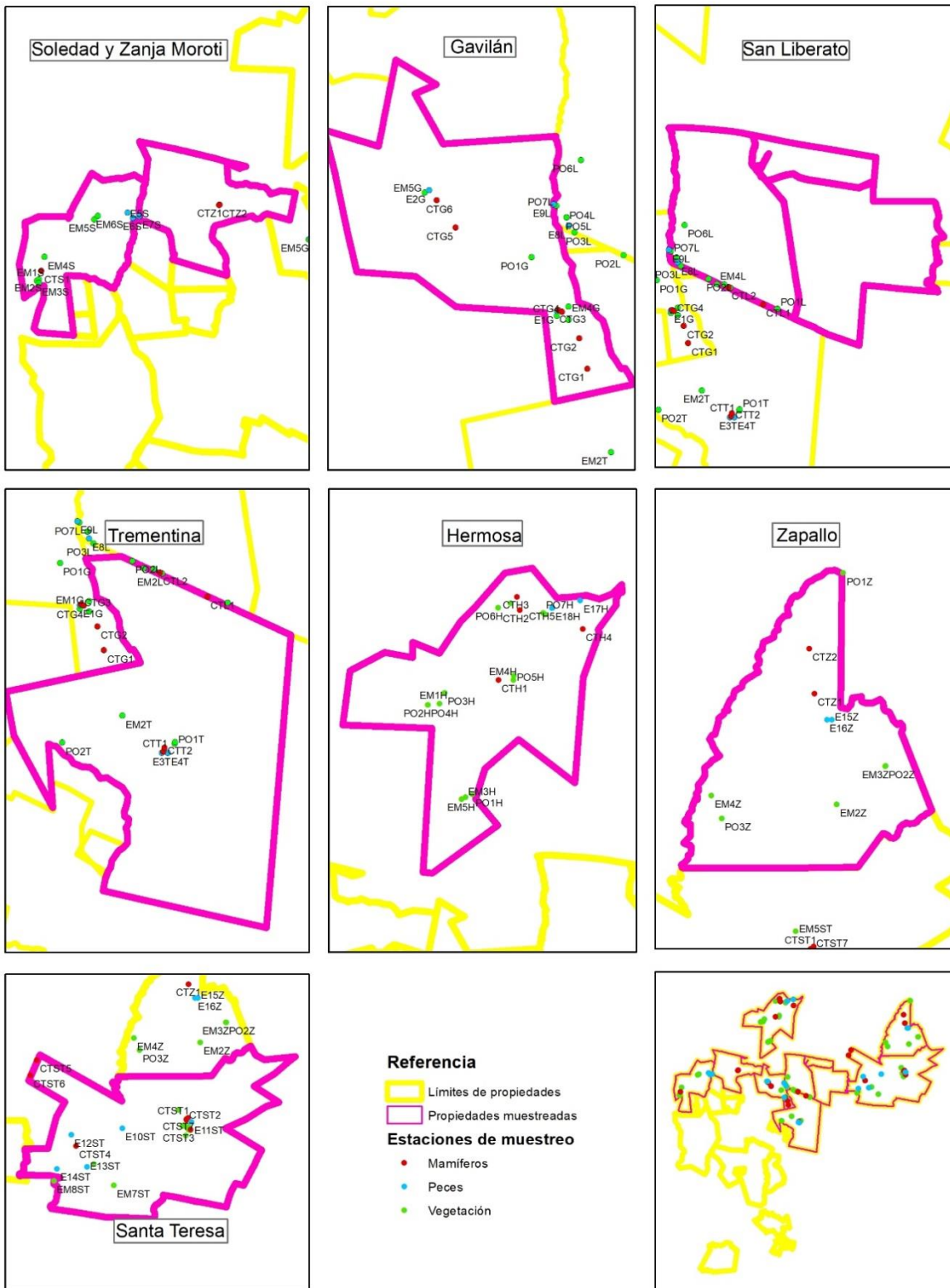
Additionally, a survey was carried out especially oriented to bats, which was carried out using two methodologies: direct (mist networks) and indirect (bioacoustics) methods. During seven consecutive nights (April 10 to 16 of this year), five mist nets 9 m long and 2.5 m high (hours: 5:00 p.m. to 11:00 p.m.) were placed at the selected sampling points of each area (for specific localities see [Distribution of sampling points](#)). The captured specimens were photographed, measured and identified, determining their species. For the identification of the specimens captured with the mist nets, morphometric measurements of the body were taken (body length, tail length, ear length, forearm length) as well as data on sex, reproductive status, age and weight of the individual, after this procedure the bats were released. The keys used for identification were López - González (2005) and Díaz et al. (2016).

Mist nets are an effective method for species of the Phyllostomidae family, as they forage mainly in the understory, while for insectivorous bat families (eg. Molossidae and Vespertilionidae) whose feeding mode and echolocation system influence the type of flight (maneuverability, height) decreases the probability of capture in nets. Therefore, the traditional monitoring (mist nets) was complemented with acoustic monitoring, which consists of the identification of ultrasound vocalizations emitted by the different species of bats through the echolocation system they use to obtain food, communication and foraging. For this methodology, the active acoustic method was implemented for 40 minutes (hours: 7:40 p.m. to 8:00 p.m.) each of the seven nights at each established sampling site. An Echo Meter Touch Pro 2 acoustic detector (Wildlife Acoustics-Maynard, Massachusetts, United States) was used. An angle of 45 ° and the height of the device were taken into account to optimize the emission range of the acoustic sample (Pinillia-Cortéz & Rodríguez-Bolaños, 2017).

Also, in each sampling site during the seven nights a recording station was installed; for this, the Song Meter SM4 BATS-FS recording equipment was used connected to an external omnidirectional ultrasonic microphone (Wildlife Acoustics-Maynard, Massachusetts, United States); and passive acoustic monitoring of the bats was carried out (from 7:00 p.m. to 6:00 a.m.). The equipment was installed at a minimum height of 1.5 m from ground level. For the analysis and identification of the ultrasonic vocalizations recorded by the SM4BAT and the Echo Meter Touch Pro 2, the Kaleidoscope Pro software (Wildlife Acoustics-Maynard, Massachusetts, United States) was used. Throughout the sampling work, the Biosafety Protocol implemented by the Latin American and Caribbean Network for the Conservation of Bats (RELCOM) (https://www.recomlatinoamerica.net/images/PDFs/Manual_de_manejo_de_murcielagos.pdf), in such a way that during the handling of bats, N95 mask was used and constant hand washing and alcohol sanitation were used.

The complementary samples of fungi and invertebrates were random. The fungal specimens were located and randomly collected and photographed in situ, enumerated and dehydrated. Later deposited in Fungaria. For taxonomic identification, they were macroscopically described taking into account size, texture, color changes and substrate. For partial identifications, a bibliographic review of scientific articles, magazines, taxonomy manuals and pictorial atlases was carried out to catalog the possible species of fungi found in the place.

Figure 2-2 Location of sampling stations, observation points and camera traps



Ref.: PO: Vegetation; E: Ichthyofauna; CT: Trap cameras; EM: Vegetation and fauna. S: Soledad; Z: Zanja moroti; G: Gavilán; T: Trementina; L: San Liberato;

3. RESULTS

3.1. Sampling areas and ecoregions

The *Cerrado* in Paraguay occupies relatively small discontinuous areas forming a mosaic pattern. As a formation, the *Cerrado* is classified under various ecoregions (Figure 3–1 and Figure 3–2); however, it became evident that the study area is more of a convergence between the *Cerrado* and the contiguous Humid Chaco and Upper Paraná Atlantic Forest ecoregions, more in line with what was proposed by Dinerstein et al. (2017). With this in mind, the study area presents a *Cerrado* - Atlantic Forest transitional area to the south and east, meanwhile to the west and south, the study area presents a *Cerrado* - Humid Chaco transition. This confluence results in unique characteristics in terms of the assemblages of fauna and flora present.

Figure 3-1 Location of properties based on MADES Ecoregions (Resolution 614/2013)

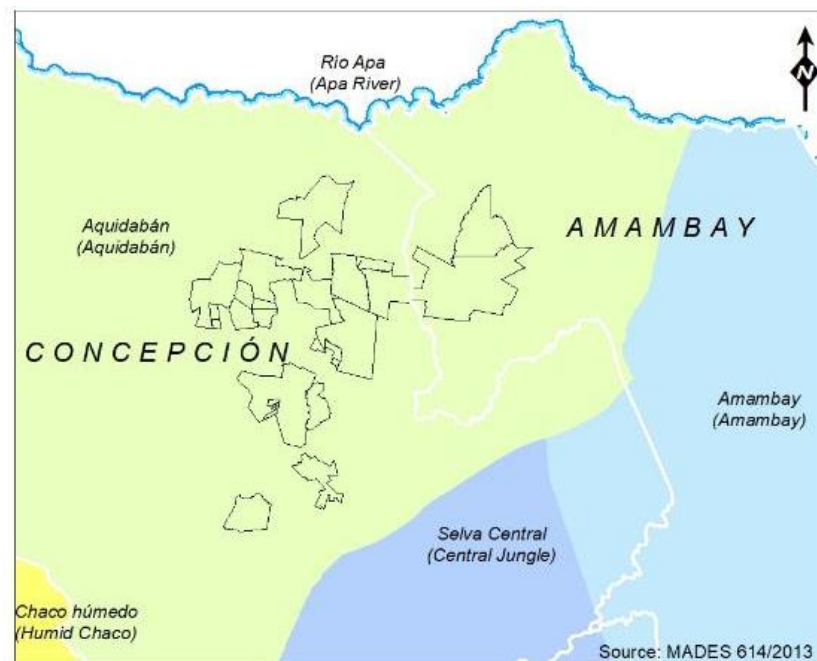
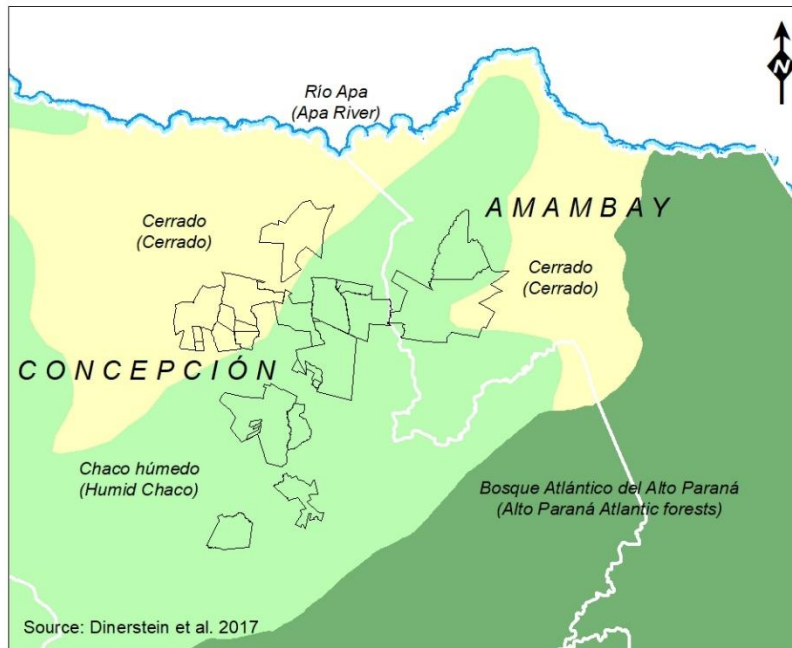


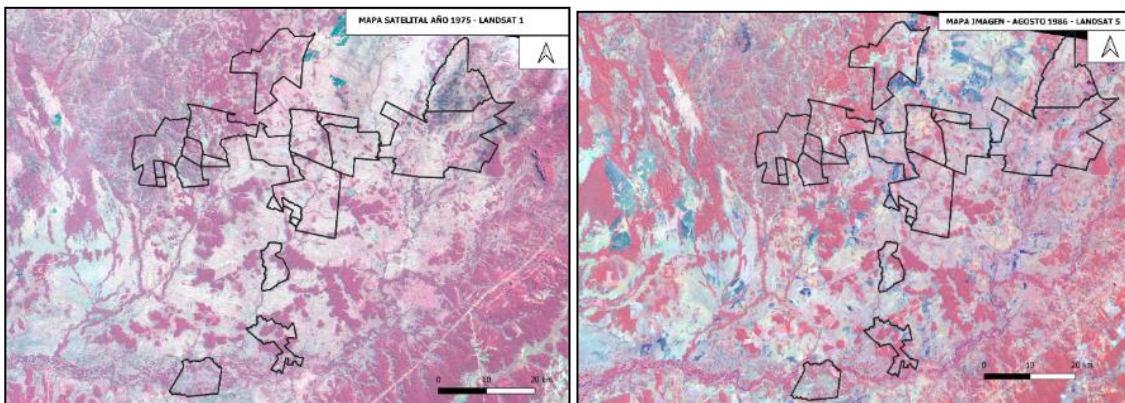
Figure 3-2 Location of properties based on Ecoregions by Dinerstein (2017)



In both biogeographical and ecoregional terms, the area is located within the *Cerrado* in a broad sense, yet it is common to find environments that correspond to the Humid Chaco in some properties, while others present elements and environments that correspond to the tall forests of the Atlantic Forest of Alto Paraná.

Within the study areas, tall forests and forest patches develop on the higher grounds with different soil characteristics; this vegetation presents a floristic structure and elements of tall forests ([Vegetation and Flora](#)). The presence of these forests is easily identifiable in historic images (Figure 3–3) that allow us to visualize the study area prior to the changes made in the productive landscape.

Figure 3-3 PARACEL properties on satellite images (Landsat 1) from 1975 and 1986



Ref.: Vegetation is seen in red tones, darker and more solid red areas represent forests, and lighter and less solid red areas represent sparse vegetation and/or of less height, and lighter tones represent natural grasslands

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3.2. General information

The floristic richness for the study area is comprised of 770 species of vascular plants, belonging to 373 genera and 97 botanical families. All the systematized information and record data are presented in a spreadsheet that can be accessed through the following link: <https://drive.google.com/file/d/1zN4bHbeze2IL-k2-GfZl7W8lxch5nLmt/view?usp=sharing>. Also the information about common names and conservation status (national, regional, IUCN) is found in the same spreadsheet.

In terms of fauna, a total of 463 species of vertebrates were recorded belonging to 110 taxonomic families among the four taxa surveyed: 81 species of fish, 59 species of amphibians and reptiles, 260 species of birds, and 63 species of mammals (Table 3–1). All information has been systematized by taxonomic group and the data is presented in a spreadsheet which can be accessed through the following link: <https://drive.google.com/file/d/1260aFeg4zNJetUBfqqlW1ThlMcPqEAI5/view?usp=sharing>. Also the information about common names and conservation status (national, regional, IUCN) is found in the same spreadsheet.

Species richness ranks as follows: birds (260), fish (81), mammals (63) and, amphibians and reptiles (59), with the taxonomic families following the same descending order for the two most abundant taxa (50 for birds, 27 for fish) and a reversed order for mammals (20) and amphibians & reptiles (13).

Table 3-1 Fauna and flora species richness

Taxonomic Group	Number of Species	Number of Families
Fish	81	27
Amphibians & Reptiles	59	13
Birds	260	50
Mammals	63	20
Pteridophytes	22	08
Monocots	139	15
Dicots	539	74

During fieldwork, the opportunity was taken to record species other than the taxa focused on in the diversity baseline study, including fungi and invertebrates. The collection of images and latter identification resulted in the mention of a total of six species of fungi, one spider and one grasshopper, as well as other invertebrates including twelve species of butterflies ([Other species identified](#)) in the field campaign of December, and 21 species of fungi with photographic records, five of them with gastronomic importance and nine of medicinal importance, collected during the March-April field campaign (see fungi report in [Fungi species recorded](#)). In May campaign, 40 species of fungi with photographic records were registered, of which 6 of them were of medicinal importance and one of gastronomic importance. In the low and high savannas, an abundance of Psilocybioides fungi of the genera *Psilocybe* and *Panaeolus* was found in the manure of herbivorous animals; however, only one species associated with Poaceae of the genus *Hydnopolyporus* was found in low savannas.

3.3. Plant formations

The following **eight plant formations or plant communities** were identified, three of which correspond to forest phytophysionomies and five to savannas: Degraded Tall Forest, Riparian Forest, *Cerradón*, *Campo Cerrado*, Dirty Fields (*Campo Sucio*), High Savanna and Floodable and Flooded Savanna, each with varying degrees of richness (Figure 3–4).

Plant formations or communities for Paracel properties embrace 179,713 hectares where based on 300 sampling and validation points on spectral information from satellite images allowed expert discussions which ended in the clear identification of Savanna, Forest, Riparian Forest, Implanted pasture/Agricultural crop, Forest plantations, and Waterbodies. Savanna (53%) is the most widely represented followed by forests (16%) and Implanted pasture/Agricultural crop (14%), and others. The document https://drive.google.com/file/d/1POx8_5UiVdN9gCdH7-vtFmbg_oOA-9tx/view?usp=sharing in detail depicts information on the methodology and the results of spatial distribution and estimation of areas.

The **Degraded Tall Forest (BA)** is characterized by presenting an average height of 12 m (which can reach up to 18 m) with three strata; the middle and lower strata being the ones with the highest density and diversity of species. In this formation the understory is not very dense, with few epiphytes and lianas. The natural regeneration of some tree species was noted. There is evidence of selective harvesting of its most valuable species and the invasion of exotics in the clearings. The soil is sandy in texture, red in color and covered by a thick layer of leaf litter. In this formation, six surveys were done with 127 species recorded.

The **Riparian Forests (BR)** follow water courses, and are generally contiguous with floodable savannas. They are characterized by having an average height of up to 14 m (which can reach up to 18 m) with three strata, the lowest being the one that presents highest density and diversity of species. It is important to highlight the presence of tree species belonging to the *Cerradón*. In this formation, the understory is sparse, with few epiphytes and lianas; however, the natural regeneration of tree species is visible. There is evidence of selective harvesting of its most valuable species as well as the presence of cattle. The soil is sandy, and covered by abundant leaf litter. In this formation, 15 surveys were done and 179 species were recorded.

The ***Cerradón* (CD)** is a plant formation characterized as an open semi-deciduous forest, presenting a height of up to 16 m, with three strata, the middle and lower strata being those with the highest density and diversity of species. Most of the tree species are typical of the formation and can also appear in more open formations such as the *Cerrado*. Most of the species are adapted to periodic burning, by presenting thick, corky and cracked bark. The understory is very open, with few epiphytes and lianas. Not much can be observed in the way of natural regeneration of tree species. The soil is sandy, shallow, covered by abundant leaf litter, and with rocky outcrops appearing in certain sectors. In this formation, six surveys were done and 128 species were recorded.

The ***Campo Cerrado* (CC)** is a type of savanna formation, characterized by the dominance of sub-shrub species, with highly developed underground structures. Herbaceous species are present in proportionally lesser quantity and represented, among others, by numerous species of grasses forming large patches. Evidence of periodic burning was noted. The soil is sandy, the topography is undulating and in certain sectors with rocky outcrops. In this formation, three surveys were done and 152 species were recorded.

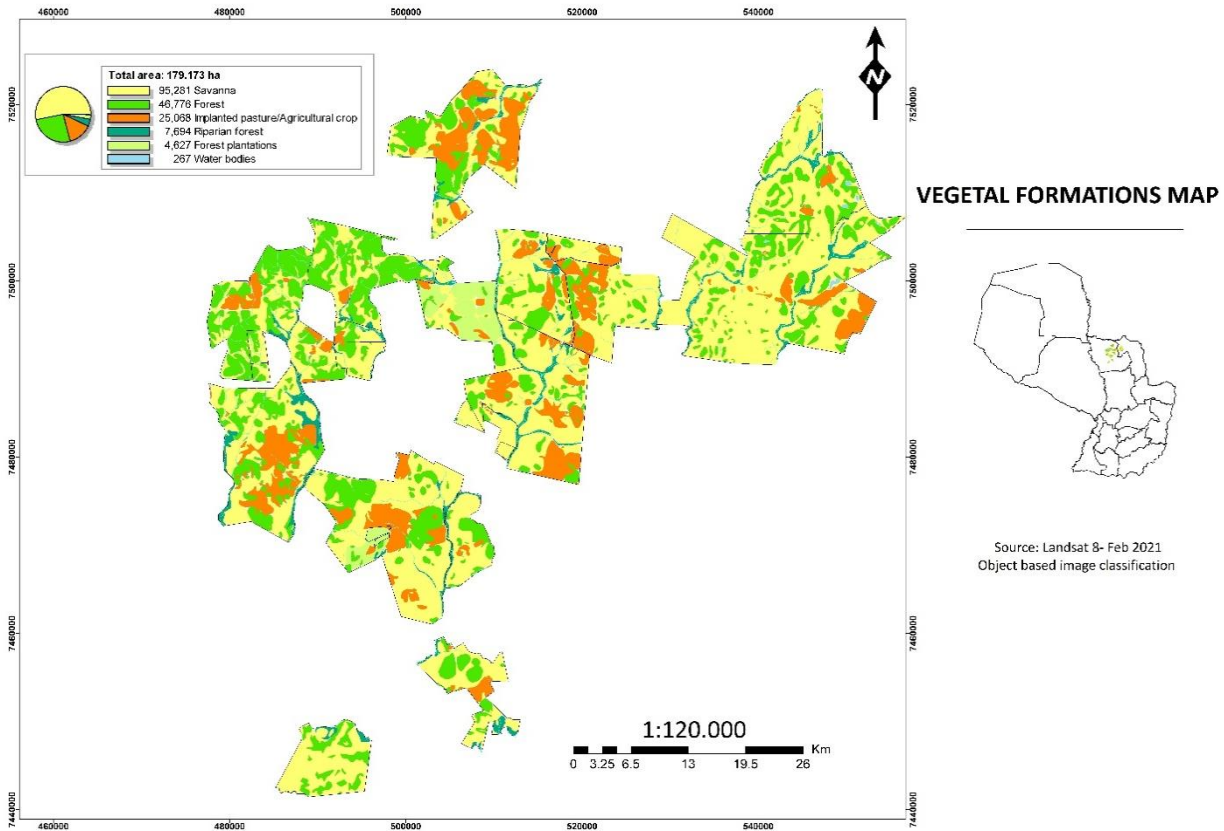
The **Dirty Field** or **Campo Sucio (CS)** is a phytophysionomy of the *Cerrado*, which also presents a predominance of sub-shrub species forming extensive patches of several individuals, with characteristic species of the formation and some typically ruderal. Evidence of extensive grazing is noted, such as bare and compacted soil. It occupies the higher parts of the terrain, with undulating topography, sandy soils, and with little leaf litter. In this formation, three surveys were done and 124 species were recorded.

The **High Savanna (SA)** formation occupies the highest parts of the terrain, which are contiguous with forest formations. They present a mainly herbaceous cover with predominance of grasses, mainly *Elionurus muticus (Espartillo)* and *Aristida* sp., as well as other herbaceous species and some trees either as isolated individuals or in small groups or patches. They are prone to extensive grazing and periodic burning. The presence of large patches was also recorded, mainly of *Syagrus campylospatha (Jata'i mi)*. The soil is sandy. In this formation, seven surveys were done and 180 species were recorded.

The **Floodable Savanna (SI)** formation occupies the lowest parts of the terrain and borders with the forest formations. They present a mainly herbaceous cover with a predominance of grasses forming large patches, as well as other herbaceous aquatic and palustrine plants, and some trees either as isolated individuals or in groups forming small patches. In certain sectors, the presence of large patches, mainly of *Syagrus campylospatha (Jata'imi)*, were also recorded. At other sites, the presence of isolated individuals of *Copernicia alba (Karanda'y)* and *Acrocomia aculeata (Mbokaja)* was observed, as well as *Machaerium hirtum* at an arboreal level. Within certain sectors of the localities surveyed, the presence of bodies of water was observed, presumably formed some time ago by the damming of small water courses, and that have since been colonized by aquatic and/or palustrine plant species, either free-floating or bottom-rooted, depending on the depth of the water. Based on the verification of certain evidence, this formation is prone to extensive grazing as well as periodic flooding and burning. In this formation, 13 surveys were done and 283 species were recorded; thus the plant formation with the highest biodiversity.

The **Flooded Savannah (SIn)** formation is a large wetland, characterized by the dominance of few species, including Cyperaceae and Fabaceae, mainly *Aeschynomene* aff. *americana* growing in isolation. This savanna has permanent water and an organic substrate. Cyperaceae species are dominant and they cover a large area. Other registered species are: *Eleocharis* spp. ; *Utricularia* spp., *Hibiscus sororius*, *Ludwigia nervosa*, *Nymphoides indica*, *Pontederia* aff. *Subovata*. In a few sectors, there appear floating vegetation (embalsados) of about 10 to 15 meters in diameter, colonized mainly by woody plants of the Onagraceae, Fabaceae and Malvaceae families. Some registered species are *Habenaria* aff. *repens*, *Mayaca sellowiana*, *Myrsine* sp., *Cecropia pachystachya (amba'y)*, *Bacopa* aff. *salzmannii*, Pteridophyta, Melastomataceae, *Xyris* sp., *Hydrolea* aff. *spinosa* var. *paraguayensis*. Also included within this formation is the aquatic-marsh vegetation registered in several places where there is presence of water bodies, either natural or artificial, of variable extension and depth, mainly linked to the availability of water for livestock. In this category, one survey was carried out and 25 species were registered.

Figure 3-4 Plant formations in the different properties



As a result of the baseline study, the presence of the different plant communities or formations has been mapped (Figure 3–4), and the FFPRI-CIF / FCA (2012) map, with it it is possible to compare the changes that have occurred (Figure 3–5). Also, the 2020 land cover map (Figure 3–6) provides evidence of predominance of sabanoid formations. The complete description, including structure and characteristic species, is presented in the Vegetation and Flora [Vegetation and Flora](#) Annex.

The Savanna formations are the ones with the greatest floristic diversity, with the Floodable Savannah standing out, with the highest number of species, approximately 100 species above the High Savannah, plant formation that follows in diversity in decreasing order (graph in [Richness of vascular flora for plant formations](#) depicts the total richness of all natural communities). According to Mereles (2007) the Savannas are very frequent plant formations in Paraguay, they constitute large areas of grasslands with woody plants grouped on islands or isolated woody ones; They are developed in both natural regions of the country. According to the prevailing types of soils and the anthropic intervention, the savannas can be: palmlands (with hydromorphic soils or not), "espartillares" grasslands (*Espartillo* grass), park savanna, among the most common ones.

The plant formation with the least floristic diversity is the Campo Sucio, which, as already mentioned, is a Cerrado phytophysionomy, with species typical of the formation and some typically ruderal, this resulting mainly from the history of use.

Figure 3-5 Imagen Map Cover and Use for all PARACEL properties, after CIF FFPRI FCA/UNA (2011)

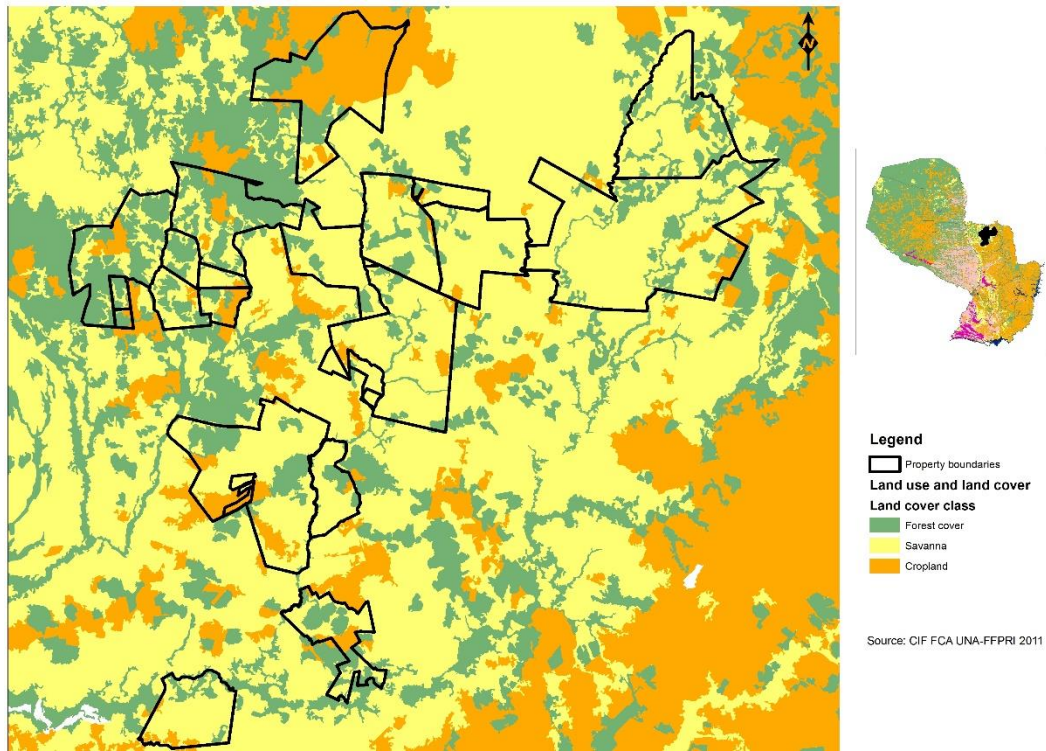
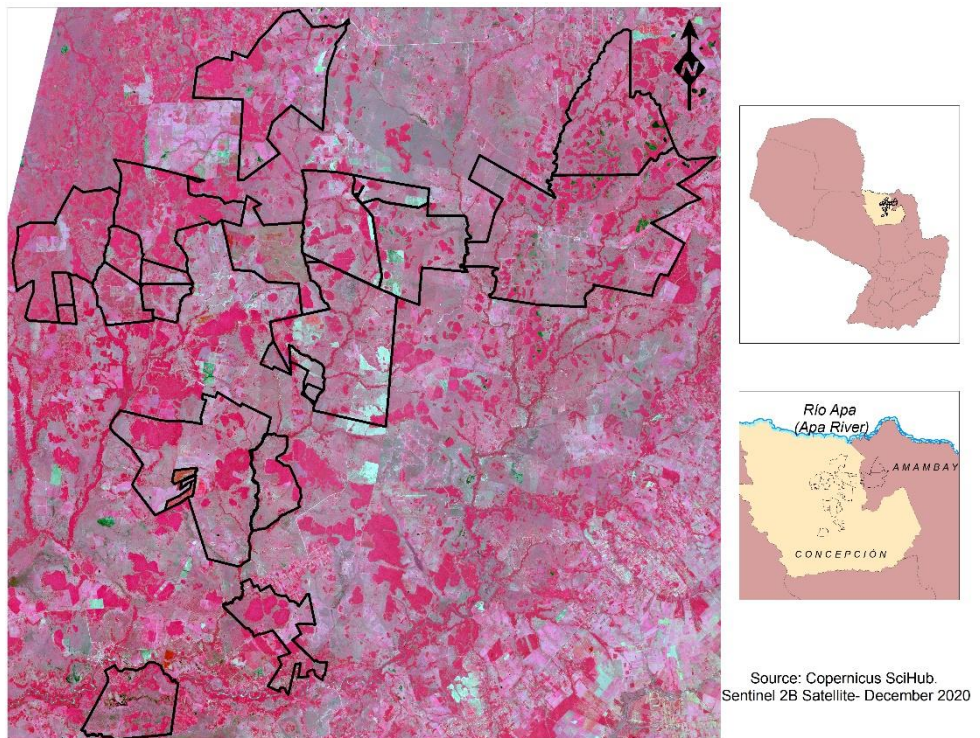


Figure 3-6 Imagen map for 2020 Cover (Copernicus SciHub 2020)

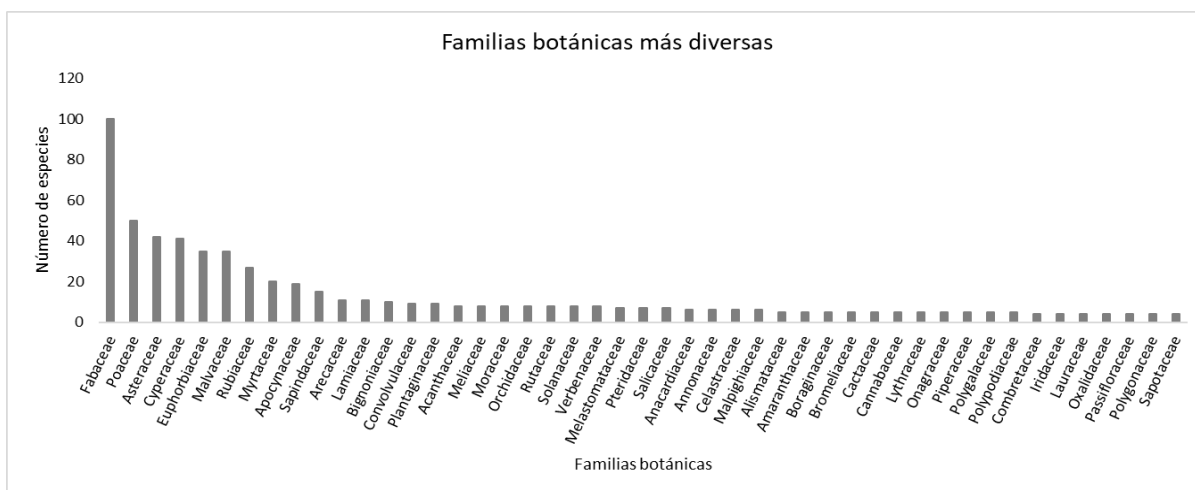


3.4. Floristic richness

The floristic diversity of all the identified plant formations was determined based on direct observations, collections and processing (in the field and in the office) of more than 3,500 specimens of vascular plants (both fertile and sterile).

The flora richness of the studied area is represented by 700 species; 373 genera and 97 families. Eight Families, 15 genera and 22 species are Pteridophyta; 139 species, 58 Genera and 15 Families are Monocotyledonae and 539 species, 300 Genera and 74 Families are Dicotyledonae. Based on Mereles (2007)'s estimates regarding the richness of vascular plants for Paraguay, consisting of some 6,500 species, this figure represents 10.8%. Of the 97 Families recorded, the 10 Families with the highest number of species are Fabaceae, Poaceae, Asteraceae, Cyperaceae, Euphorbiaceae, Malvaceae, Rubiaceae, Myrtaceae, Apocynaceae and Sapindaceae, in decreasing order of importance, as shown in Figure 3-7.

Figure 3-7 Families with highest biodiversity identified within PARACEL properties



All plant formations, the flora and the fieldwork process were recorded by approximately 10,000 digital photographs, which are included in the annex of [Vegetation and Flora](#), and systematically through the following link: <https://drive.google.com/drive/folders/1n0Yd4R0zqLjEctiTd-tKVLcQVxE135KJ?usp=sharing>.

The **endemic flora** (Peña-Chocarro & De Egea 2018) is represented by three species: *Bidens chodatii* (Asteraceae), *Ipomoea* aff. *aemilii* (Convolvulaceae) and *Arachis hassleri* (Fabaceae). Of the total species recorded, 18 are included in the National List (as Endangered or Threatened) and seven are included in the IUCN List. Seven more are included in Appendix II and one in Appendix I of CITES.

Eight **types of use** were identified (food, fuel, animal feed, industrial, construction material, medicinal, melliferous and ornamental) for 162 species of the flora surveyed within the study area. A detailed list of all species with their corresponding uses is found in the [Vegetation and Flora](#).

Regarding threatened species, of the total of registered species, 33 present some category of threat, 18 in Resolution 470/19, categorized as Endangered or Threatened with Extinction, 11 are in Appendix II of CITES and one in Appendix I, and 7 in the IUCN List (Vegetation and Flora Annex).

3.5. Ichthyological survey

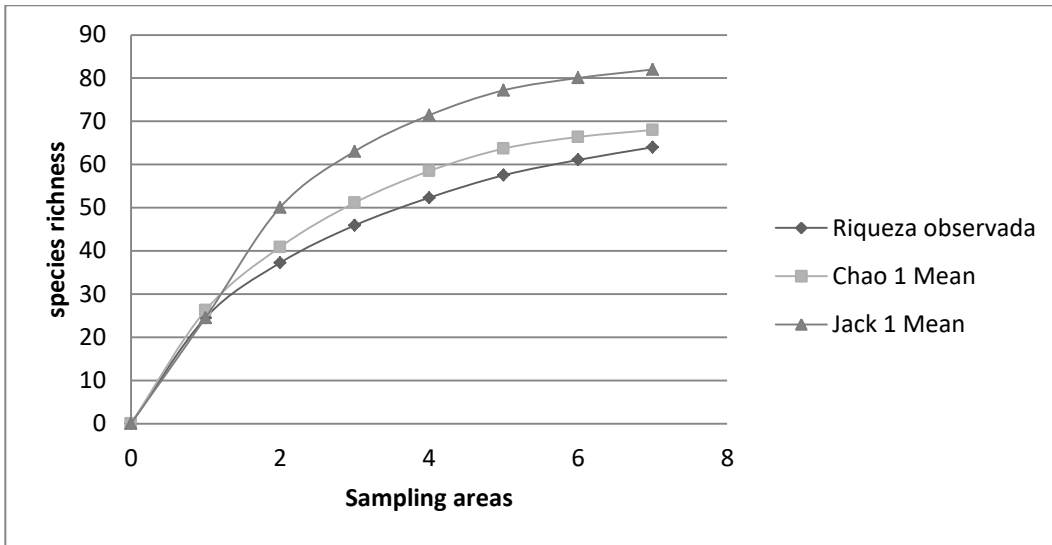
The 81 species that make up the ichthyofauna surveyed represent 26% of the ichthyofauna in Paraguay, according to the Koerber, Vera & Reis (2017) checklist, and are present in the photographic record in the ichthyological annex as well as the methodology used. In total, 27 Families distributed in 7 Orders were registered, being the Order CHARACIFORMES with 10 Families the one with the greatest richness, within which Characidae (*Mojarras*) is the Family with the highest number of species recorded (23 species). Regarding abundance, the predominant fish is *Corydoras aeneus* with 1088 (24.41%) specimens for the four sites (properties), followed by *Odontostilbe pequirá* with 702 (15.75%), *Aphyocharax anisitsi* with 200 (4.49 %) and *Hyphessobrycon eques* with 198 (4.44%); there are 13 species for which only one individual was captured in the entire monitoring. The Characidae family is the richest with 23 species (See [List of species with common names in Spanish, Guarani and English](#)). Regarding threatened species, *Potamorhaphis eigenmanni* (Needle fish) categorized as VU (Vulnerable) according to MADES Resolution 1563/09 and *Odontostilbe pequirá* (mojarra) is categorized by IUCN at the regional level as LC (Least Concern) . The AM Santa Teresa was the one with the highest richness (See [Absolute and relative abundance of fish](#)) with 41 species, and San Liberato AM with the least richness (13). The mojarra *Odontostilbe pequirá* was the only species present in each of the ranches, while *Corydoras aeneus* is the most abundant species. A total of 10 species (20%) is used in subsistence fishing, 7% in commercial fishing and 23 species are for ornamental uses. Fish of the family Heptapteridae (catfish) are probably traditionally the most sought after in subsistence fisheries.

During the rainy season survey, 64 species were found, the most abundant species was *Odontostilbe pequirá* (Mojarrita). In the campaign corresponding to the dry season, 62 species were identified, of which 17 were new, the most abundant species was *Corydoras aeneus*, this species had great dominance in several AMs (see [Abundance of total fish species per sampling area](#)), in this campaign two new groups were recorded, corresponding to the Order of MYLIOBATIFORMES, which are the freshwater stingrays and SYNBRANCHIFORMES, commonly called “eels”.

In terms of abundance, *Odontostilbe pequirá* is the most frequent fish species in the seven sampling areas (properties) with 470 (26.14%) individuals, followed by *Corydoras aeneus* (153- 8,5%) y *Moenkhausia dichroua* (108 – 6%). There are eight species for which only one individual was captured during the entire monitoring. The 64 species of ichthyofauna recorded represent 21% of the Paraguayan ichthyofauna, according to the checklist of Koerber, Vera & Reis (2017), and together with the methodology used, have been included in the photographic record found in the [Ichthyology \(fish\)](#) annex.

The Characidae family is the richest with 18 species ([Ichthyology \(fish\)](#) annex). With regard to threatened species, it can be mentioned that *Potamorhaphis eigenmanni* is VU (Vulnerable) according to MADES Resolution 1563/09 and *Odontostilbe pequirá* (mojarra) is categorized by IUCN as LC (Least Concern) at a regional level. Santa Teresa sampling area held the highest richness (see [List of species by sampling areas](#) with 32 species, while the San Liberato sampling area/site presented the lowest richness with only 10 species. The mojarra *Moenkhausia dichroua* was the only species to be present at all of the ranches, while *Odontostilbe pequirá* is the most abundant species. Ten species (20%) are used for subsistence fishing, while seven are used in commercial fishing and 18 are used for ornamental purposes (see [Usage of recorded species in different fishing practices](#)) likely that fish from the Heptapteridae family (catfish) could typically be considered the most desirable species in terms of subsistence fishing.

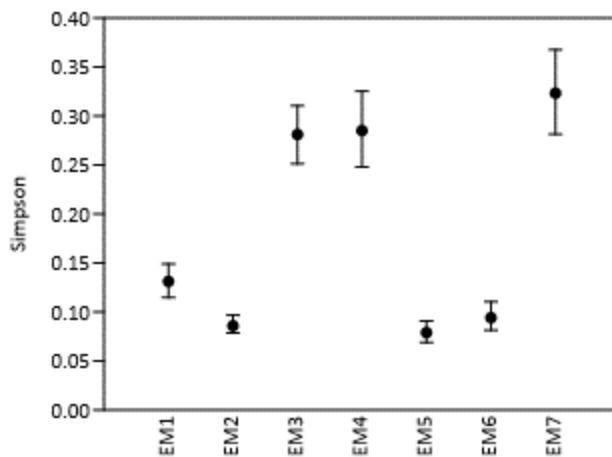
Figure 3-8 Species accumulation curve



EM1= Gavilán; EM2= Trementina; EM3= Soledad; EM4= San Liberato; EM5= Santa Teresa; EM6= Zapallo; EM7= Hermosa.

Based on the 81 species, it is estimated that approximately 95 species (95% confidence limits: 84.86 - 132.31 species) could be recorded in the area, with the same sampling effort (Chao1). However, the species accumulation curve obtained through the Chao1 and Jack1 estimators (Colwell 2009) shows that species with greater sampling effort will still be found because the curve (Figure 3–8) does not reach a plateau, According to these estimators, between 80.42% and 85.19% of the expected species were observed.

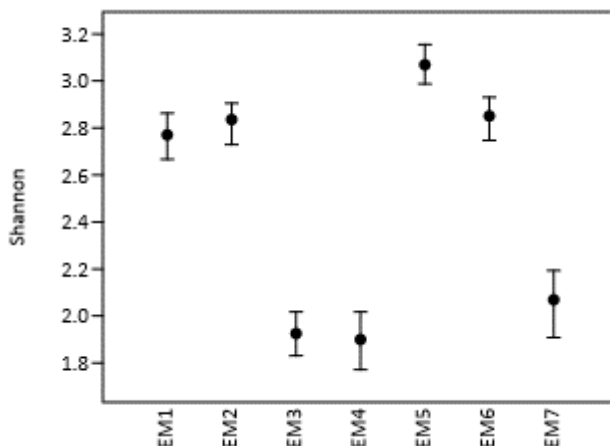
Figure 3-9 Simpson's Dominance



EM1= Gavilán; EM2= Trementina; EM3= Soledad; EM4= San Liberato; EM5= Santa Teresa; EM6= Zapallo; EM7= Hermosa.

The Simpson index represents the probability that two individuals, within a habitat, selected at random, belong to the same species. In other words, the closer the value of this index is to unity, there is a greater possibility of dominance of a species and a population; and the closer the value of this index is to zero, the greater is the biodiversity of a habitat (Magurran, 1988). According to this index, the dominance fluctuates between 0.07902 (EM7) and 0.3233 (EM2) (Figure 3–9).

Figure 3-10 Equity Index (Shannon-Wieber)



EM1= Gavilán; EM2= Trementina; EM3= Soledad; EM4= San Liberato; EM5= Santa Teresa; EM6= Zapallo; EM7= Hermosa.

The Shannon index (Figure 3–10) expresses the uniformity of the importance values across all the species in the sample; and it measures the average degree of uncertainty in predicting to which species an individual chosen at random from a collection belongs (Magurran, 1988; Peet, 1974; Baev and Penev, 1995). It assumes that individuals are randomly selected and that all species are present in the sample. It acquires values between zero, when there is only one species, and the natural logarithm of S (81 = 4,394), when all species are represented by the same number of individuals (Magurran, 1988). In this monitoring, the values fluctuate between 1.9 (EM4) and 3,069 (EM2).

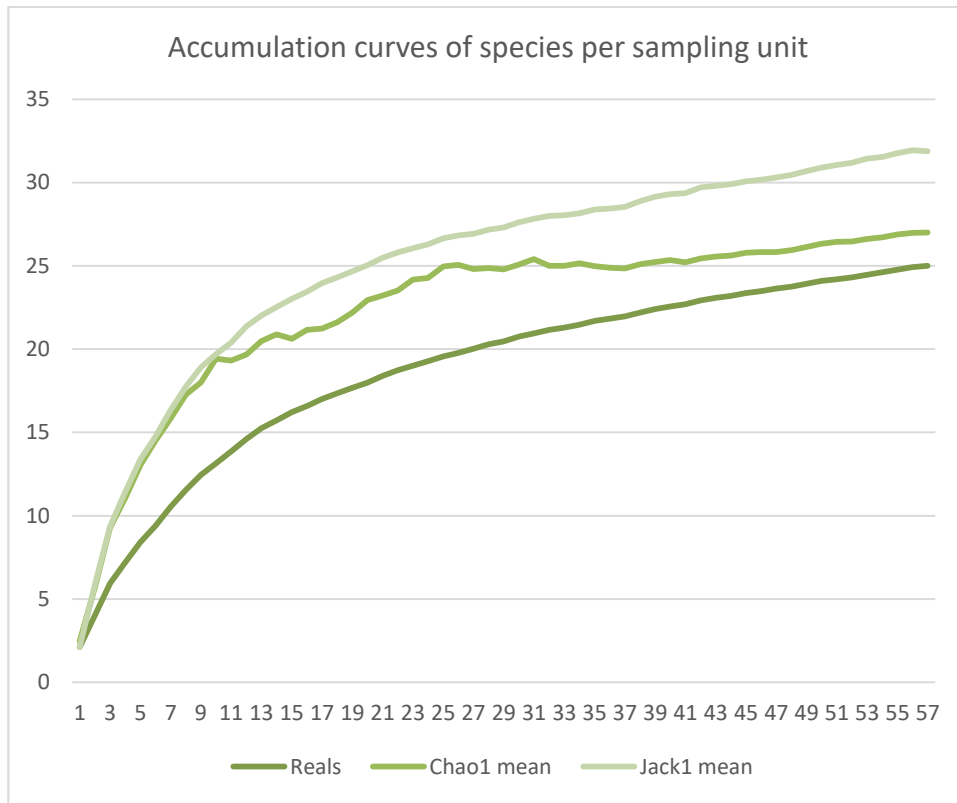
3.6. Herpethological survey

In both campaign, rainy and dry season, a total of 59 species (33 amphibians and 26 reptiles) were recorded and this represents 13 families (4 of amphibians and 9 of reptiles) (See [List of amphibians and reptiles recorded](#) for the complete lists of species). During the rainy season, a total of 31 species (24 amphibians and 7 reptiles) were recorded along the transects, while another nine amphibians and 14 reptile species were recorded during random searches and at breeding grounds in the entire study area ([Herpethology](#) see complete list of species this annex). This represents 61% of the amphibian species and 23% of the reptile species within the Concepción and Amambay Departments, combined (Brusquetti & Lavilla 2006, Brusquetti et al. 2007, Cacciali et al. 2016, Cacciali & Kohler 2018, Smith et al. 2012, Weiler et al. 2013). It is expected that the occurrence of at least another one amphibian species and twelve more reptile species is highly likely (Figure 3–11), based on the fact that these had already been observed during the evaluations of nearby conservation units, such as the Paso Bravo National Park (Altervida 2003), San Luis National Park (Rojas-Bonzi et al. 2020), Tagatiya Mi Nature Reserve (Concepción et al. 2004), and the Estancia Estrella Ranch (*Red Paraguaya de Conservación en Tierras Privadas*, 2008).

In the dry season, 24 species (16 of amphibians and 8 of reptiles) were recorded in the transects, plus 3 species of amphibians and 6 of reptiles in occasional sightings, for a total of 31 species (19 of amphibians and 12 of reptiles). These figures represent a lower number of species found compared to the rainy season, where 14 species of amphibians and 9 more reptiles were recorded.

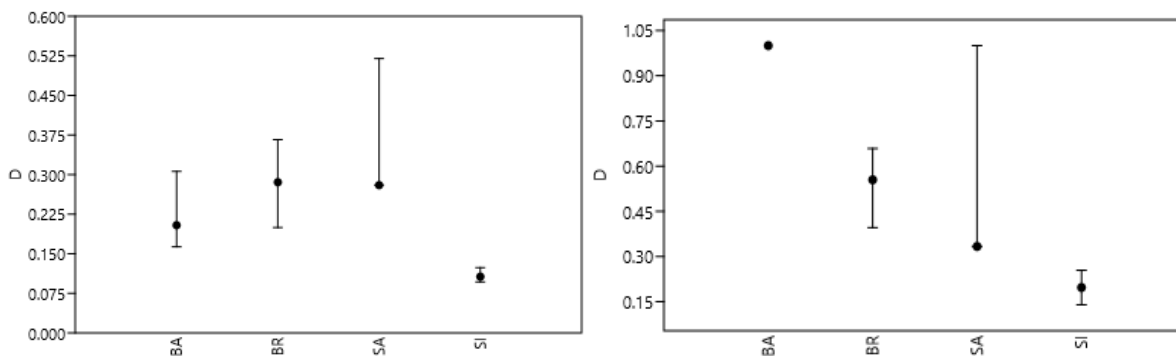
No new species of amphibian was recorded, but two species of snakes were added to the general list, these are *Palusophis bifossatus* and *Erythrolamprus typhlus* and three lizards, *Tropidurus torquatus*, *Stenocercus caducus* and *Colobosaura modesta*.

Figure 3-11 Species accumulation curve for amphibians based on each sampling unit (transects with repetitions)



Using the data obtained in the herpetological survey in both seasons, the Chao 1 and Jack 1 species richness estimators calculate that 27 species (95% confidence limits: 25.28 – 39.34 species, (Figure 3–11) could be found with the same sampling effort. As the curve does not reach asymptotes in the species accumulation curves, it is suggested that with a greater sampling effort, even more species not previously registered will be found. According to the estimators, between 92.59% and 78.41% of the species likely to occur in the area were observed.

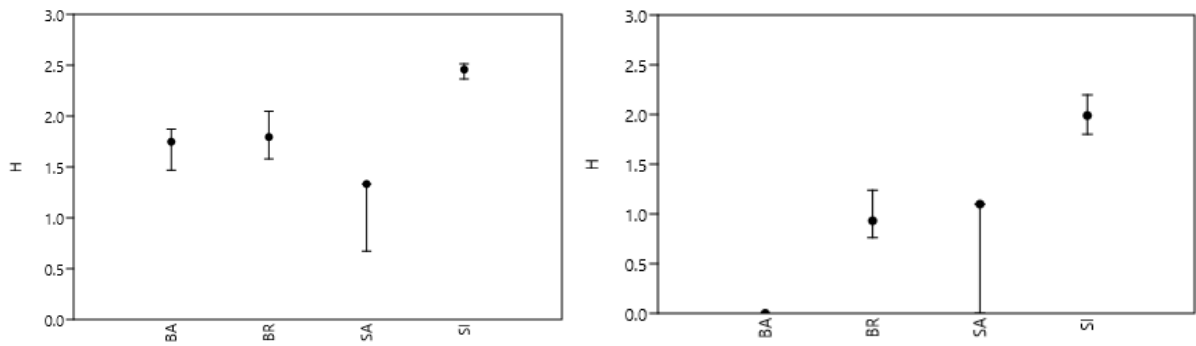
Figure 3-12 Simpson Dominance in rainy and dry seasons



BA: Degraded High Forest; BR: Riparian Forest; SA: High Savanna; SI: Floodable Savanna.

The Simpson index representing the probability that two individuals in a population are randomly selected and belong to the same species, expresses how equitable the number of individuals of the species found is (Magurran, 1988). The closer to 1 (one) the index is, the greater the dominance of common species, and the closer to 0 (zero), the more equitable the population. During the rainy season, in the BA, BR, SA and SI formations a mean dominance can be observed that fluctuates between 0.28 (BR) to 0.11 (SI) (Figure 3–12), which expresses high equality between species and low rates of rare species encounters, particularly in the SI, where low confidence intervals are observed and a mean close to 0. BA and BR have higher values, which indicates the presence of some species that are more abundant in the landscape. In the dry season, however, higher values are observed in general, with less equitable species in all formations. Similarly, SI was the one that remained with the lowest values in relation to the other formations. BA remains at 1 because only *Elachistocleis matogrosso* was found in this formation.

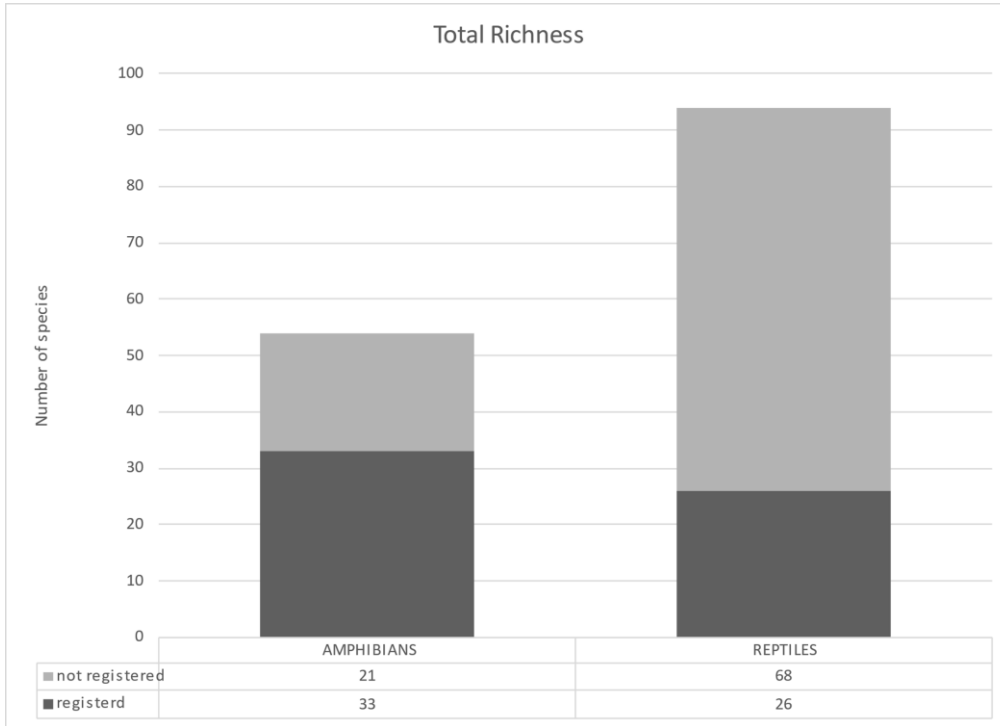
Figure 3-13 Equity Index



BA: Degraded High Forest; BR: Riparian Forest; SA: High Savanna; SI: Floodable Savanna.

On the other hand, the Shannon index expresses the uncertainty to predict to which species an individual found at random from a sample in the population will belong. The index has a value of 0 (zero) when the population sample contains only one species, and has maximum values when all the species assumed to be present are equitably represented (Magurran, 1988). In this case, the index varies between 1.3 (SA) and 2.4 (SI) (Figure 3–13) in the rainy season. This complements the Simpson index, which shows little equity in the representation of species, particularly high in SI and low in SA. For the dry season, this index also reinforces that of dominance from Simpson's.

Figure 3-14 Number of species listed for the departments: not recorded during fieldwork, recorded during fieldwork, possibly present (recorded during REA of nearby conservation units)



The amphibians recorded are all anurans (frogs and toads). The most numerous families during the rainy season in terms of species are Leptodactylidae (jumping land frogs) and Hylidae (tree frogs), both with 13 and 15 species each; followed by Bufonidae (toads) and Microhylidae (small-mouthed frogs). The most numerous genus was *Leptodactylus* (Leptodactylidae) with six species, followed by *Scinax* (Hylidae) with four species. The only family without representation that might be present is Odontophrynidae.

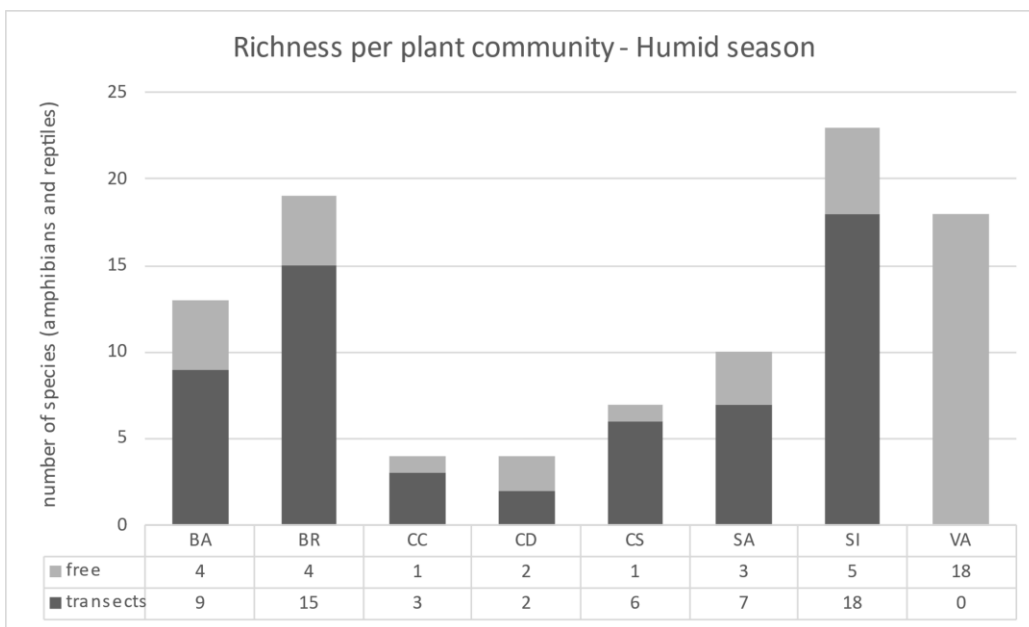
In the dry season, the Leptodactylidae and Hylidae families were also more numerous with 6 and 8 species, respectively. The Bufonidae are represented by 3 species and the Microhylidae by one. The most numerous genera were also *Leptodactylus* (family Leptodactylidae) and *Dendropsophus* (Family Hylidae), both with 4 species.

Reptiles, on the other hand, were represented by eight families in the rainy season, of which the most numerous was Dipsadidae (non-venomous snakes) with eight species, followed by lizards of the Tropicuridae family with four species. The rest were represented by only one or two species each, but from very diverse groups such as turtles, caimans, and both groups of venomous snake families: Elapidae (corals) and Viperidae (pit vipers and rattlesnakes). The most abundant group, with many individuals seen randomly throughout the entire campaign, was the Teiidae. *Teius teyou* was the most frequently seen species, with several individuals seen crossing paths during the main hours of activity.

Fewer reptiles were seen in the dry season, probably due to the unfavorable climate. They were also represented by 9 families, with the most specious as Teiidae with 4 species, followed by alligators. Unlike the rainy season, only three snakes were found, two snakes (one from the Dipsadidae family and another Colubridae) and one viper (Viperidae family). Again, the most active species in the dry season was *Teius teyou*, which was recorded in transects and in less quantity in free observations.

The three communities with highest richness of herpetozoa during the rainy season were SI (25 species), BR (19 species) and BA (13 species). Amphibians contributed most of the species to these results with 22 species in SI, 14 species in BR, and 9 species in BA (see Figure 3–15). Another element that harbors a high richness is the Aquatic and Marsh Vegetation (VA) which, although it was not strictly included in the systematic sampling, is occasionally found immersed within the SIs, but mainly in permanent and temporary water bodies of lotic and lentic systems. Through nocturnal samplings in cutwaters, wetlands, ponds and lagoons, it was possible to verify in the associated VA (See [Transects and their plant communities \(formations\). SECA = stands for transects developed during the dry season](#)) the presence of 15 species of amphibians and 3 of reptiles, which use this substrate as reproductive call sites (e.g.. *Dendropsophus nanus*, *D. minutus*, *Boana punctata*, *Scinax fuscomarginatus*), feeding (e.g. *Leptodactylus podicipinus*, *Leptodactylus macrosternum*, *Helicops leopardinus*) and / or refuge (e.g. *Caiman yacare*, *Caiman latirostris*).

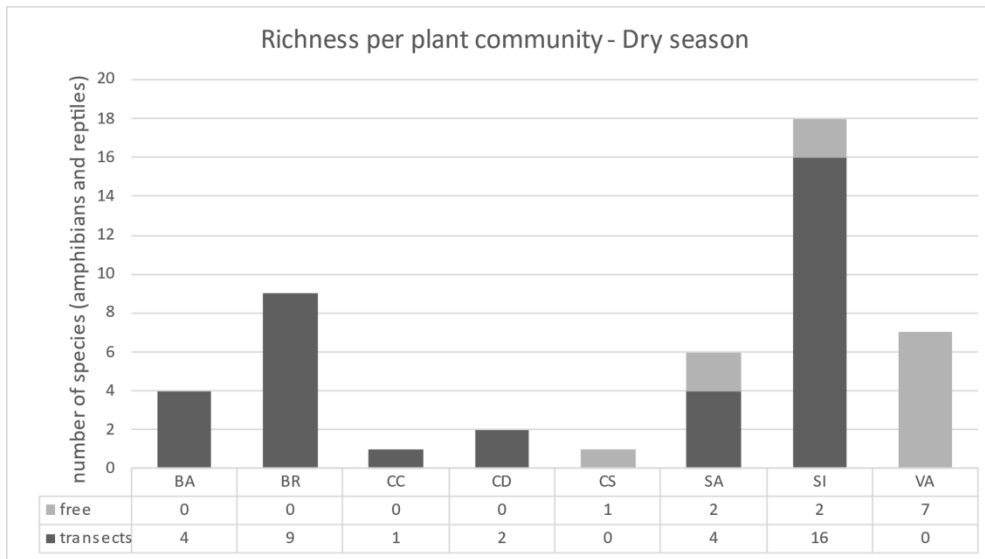
Figure 3-15 Number of species recorded under the various plant communities. Number of species found along transects and contribution from random surveys (by night, casual encounters)



Auditory records of 16 species using the SI as a breeding/mating ground during the rainy season were made based on vocalizations, which also resulted in the highest number of species vocalizing in any of the plant communities. In spite of this, surprisingly only five species of reptiles in this season were observed at this site: two of the three most recorded lizards (*Teius teyou* and *Notomabuya frenata*) and two snakes with single records (*Oxyrhopus guibei* and *Philodryas olfersii*).

BR and BA follow the SI in terms of species richness; in these formations, several species of anurans carry out vital activities such as estivation, hibernation, foraging, shelter and dispersal, as well as reproductive activities in the case of certain species (Gibbons 2003). A clear example is *Rhinella scitula*, a species that completes its cycle within the BR, breeding/mating at the edges of streams (Caramaschi & Niemeyer 2003; Maragno & Souza 2011), or the case of the males of *Leptodactylus elenae* which were recorded vocalizing from within the forest. A similar richness and abundance pattern is observed during the dry season for SI and BR, however, this is occasion, the other plant formations resulted in very low numbers to inference (Figure 3-16)

Figure 3-16 Number of species recorded under the various plant communities. Number of species found along transects and contribution from random surveys (by night, casual encounters)



Out of all the amphibian species found during the rainy season, only *Leptodactylus bufonius* and *L. labyrinthicus* were found once, inactive and found hiding/sheltered. In the case of BR and BA, six and five species of reptiles were found, respectively. In the BR we can mention the records of *Chelonoidis carbonaria* (tortoise), a sheltered *Bothrops diporus*, and a *Micrurus frontalis* which was found being preyed upon by a *Salvator merianae*; proof of the trophic interaction between herpetozoans. Furthermore, this particular event was interesting, as this lizard has been recorded preying upon multiple reptile and amphibian species (Kasperovicz et al. 2015), but not this particular coral.

In the SI, the most frequently encountered species in the rainy season was *Leptodactylus fuscus* (representing 22.6% of the total number of individuals observed), a very common and abundant jumping/leaping land frog found near permanent or temporary bodies of water, and even in degraded and urban habitats (Cei 1980, Souza et al. 2014). Other common species include *Leptodactylus podicipinus* (18%), *Physalaemus albonotatus* (7.2%) and *Pseudopaludicola ameghini* (6.9%). In the dry season, however, the most abundant species were *Pseudopaludicola boliviana* (34.5%) and *Scinax nasicus* (24%), followed by *Physalaemus albonotatus* and *Dendropsophus nanus* (6.89% in both cases).

During the sampling, *S. nasicus* and *D. nanus* were found using as refuges to bromeliads typical of higher vegetation patches in the SI, this behavior was previously observed by both species in the Pantanal (Moravec & Campos 2020), which indicates the importance of these plant formations for the conservation of anurans. In this formation, *Dendropsophus elianae* was found, a frog endemic to the Cerrado and nationally threatened, using tall herbaceous substrates in the pasture. Finally, a calcined shell of *Chelonoidis carbonaria*, a nationally threatened turtle species, was also observed. In the BR, the two most abundant species by a wide margin were the species of the genus *Pseudopaludicola*, *P. ameghini* and, *P. boliviana* (50 % and 12.5%, respectively), followed by *Physalaemus albonotatus* (9.9%), and *Rhinella scitula* (4.5%). These first three species were observed in abundance in the understory, particularly those of the genus *Pseudopaludicola*, which, using the litter and their small sizes (approx. 1 cm long), are difficult to detect.

Similar patterns were seen in BR of the Humid Chaco in the country (Moreno 2017), where in this case *P. albonotatus* and *P. boliviana* dominate the diversity of terrestrial anurans in the BR while *S. nasicus* the diversity of arboreal anurans, the arboreal species that was more abundant in this physiognomy. During the dry season the dominance of *P. boliviana* and *P. ameghini* (72% and 3.9%) and *P. albonotatus* (15.7%) was observed again, but species characteristic of this formation such as *R. scitula* and *A. diptyx* were only found by chance records outside the transects.

The encounter rates within other plant communities were too low to make any statement regarding relative abundance. Nevertheless, it is worth mentioning that during the rainy season four individuals of *Melanophryniscus fulvoguttatus* were observed (15%) in BA, making it the species (out of six) together with *P. albonotatus* with the highest number of encounters in this forest formation. Although observed in the forests, these small toads were detected calling/singing/vocalizing in tall herbaceous fields in the *Cerrado*, where temporary bodies of water form. During the dry season, *Colobosaura modesta* was found under a trunk, this is a terrestrial lizard associated to the Paraguayan *Cerrado* (Cacciali et al. 2016). In *Cerrado* phytophysionomies, *Teius teyou* was the most common, but with only four or fewer records for each formation. The diversity indices were applied only to the amphibian records, since the reptile encounters were very fortuitous and from very distant taxonomic groups. Both Shannon and Simpson indices show the same pattern ([Herpetology](#)) for both seasons, where SI and BR are more diverse with respect to BA. It is also observed that the SA has insufficient records to adjust the estimates to calculate reliable estimators. This is consistent with the results described above. Of the amphibian species listed, none have any value in terms of commercial use and are therefore not listed in CITES.

In terms of amphibian conservation status, only *Rhinella scitula* and *Dendropsophus elianae* are included under some degree of threat, both at international and national levels. *Rhinella scitula* is a small terrestrial toad (34 -51 mm) endemic to the *Cerrado*; in Paraguay it is found exclusively within the riparian forest in the Departments of Amambay, Concepción and San Pedro (Brusquetti et al. 2006, Smith et al. 2012, Sugai et al. 2014). *Dendropsophus elianae* (20 - 26 mm) is an endemic climbing frog of the *Cerrado* (Napoli & Caramaschi, 2000); it has few records in the country which all come from within the Departments of Amambay and Concepción. Its restricted distribution and few records rank it as EN (endangered) at a national level (Motte et al. 2019).

Of the reptile species recorded, none are included under any level of international threat category. At a national level, however, *Chelonoidis carbonaria* (red-footed tortoise), *Caiman latirostris* (broad-nosed caiman) and *Colobosaura modesta* are threatened (MADES Res. N°206) and two first ones listed in CITES. Among the species with a high probability of occurrence, *Eunectes notaeus* (*anaconda amarilla*) and *Boa constrictor* (*boa de las vizcacheras*) are listed in CITES; the latter, together with *Norops meridionalis* (*camaleoncito*), are threatened at a national level. *Chelonoidis carbonaria* is a large land turtle, with a widespread but fragmented distribution in South America, whose southern portion covers most of the Pantanal biomes, the northern portion of the Chaco and southern portion of the *Cerrado*. The only two records obtained in BR at the main course of the Trementina (22°37'54.1" S, 56°54'01.0" W), an area almost unaffected by anthropic activities, though locals affirm that it is also seen in more modified areas, and a calcined carapace at Zapallo SI (22°31'18.2" S, 56°36'42.0" W). Finally, *Colobosaura modesta* is a terrestrial lizard broadly ranging in Brazil and reaching Paraguay in the *Cerrado* and the Humid Chaco. This species is considered endangered due to its scarce presence.

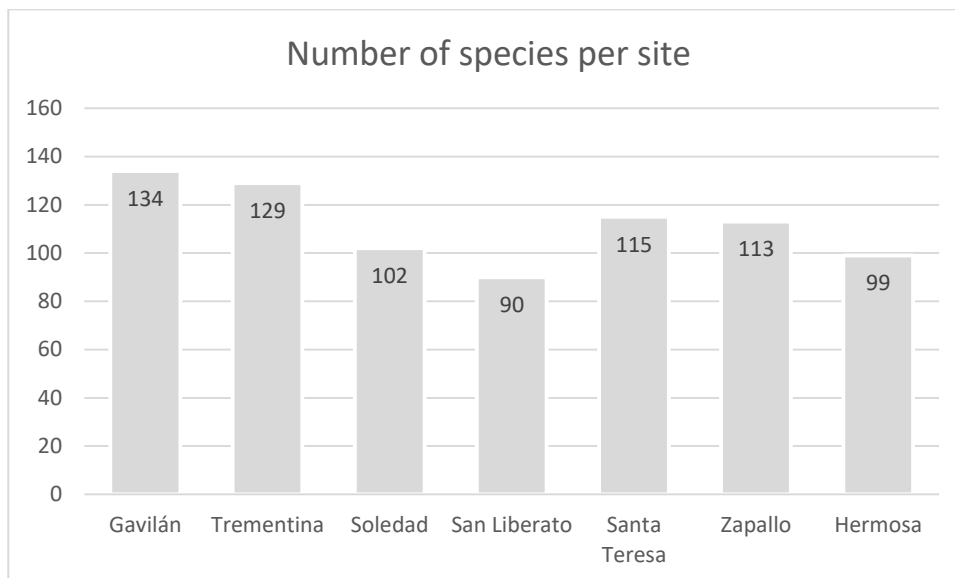
At present, there are no legal commercial uses of reptiles in Paraguay (MADES – DGPCB 2019) though historically the local populations, immigrants and indigenous, have utilized wild species for subsistence, trade, pets, medicines and rituals (MADES – DGPCB, 2019), including reptiles such as boas, aquatic and terrestrial turtles e.g. *Chelonidis carbonaria*, both species of caimans and tegu lizards (*Salvator*). In the 80s and 90s, there were national programs for caiman (Aquino & Scott, 2008), boas (Waller et al., 1995), and tegu lizards (Mieres & Fitzgerald, 2006) harvesting mainly focused on their hides. None of these programs are any more valid and the trade of these species is illegal.

3.7. Ornithological survey

A total of 260 species of birds were recorded, belonging to 26 orders and 50 taxonomic families, including the Tyrannidae (15%), Thraupidae (11%), Furnariidae and Psittacidae (6%) families with most species recorded. The dominant species of the first most abundant family varied during the wet and dry seasons, being the most common during the first season: *Tyrannus melancholicus*, *Megarynchus pitangua*, *Myiarchus tyrannulus* and *Empidonomus aurantioatriocristatus*, which by the shape of the beak hunt larger insects in flight, unlike the drier season, where the availability of various flying invertebrates is reduced, in addition, these birds carry out regional migrations, therefore, they are replaced by other residents and / or migrants from the south, registered in the winter campaign, which were: *Xolmis velata*, *Xolmis irupero*, *Xolmis cinereus*, *Hymenops perspicillatus*, *Myiarchus ferox*, among the most common. The increase in the number of registered species of the Trochilidae family stands out, compared to the summer campaign in the wet season, which, according to Oliveira and Marquis (2002), is probably a general phenomenon during the dry season since these species make a movement local towards gallery forests. In some cases, towards specific and fundamental plants in their habitats that bloom only for very limited periods and provide much-needed resources this season. The same authors mention that 90% of fruits available in the forest for consumption in forests and cerrados is due to parrots such as *Amazona* spp. and *Ara* spp., species that after eating part of these fruits, let them drop and are later consumed and dispersed by other birds or small mammals.

Among the sampling areas Gavilán and Trementina presented highest number of species recorded during field monitoring (60% and 58%, respectively), followed by Santa Teresa (52%) and Zapallo (51%). Soledad and Hermosa recorded the 46 and 44% of total species, while San Liberato was the site with the less recorded species (40%) (Figure 3–17). The difference in number of species recorded between the highest and lowest sampling areas was due to the fact that the travel to and from the other sampling areas was made from Gavilán, thus creating a greater opportunity to record occasional species, and this impacted on the total richness of these sites in particular, as well as due to the heterogeneity of natural communities present in each AM (see [Sampling avifauna in different natural communities in study area](#)).

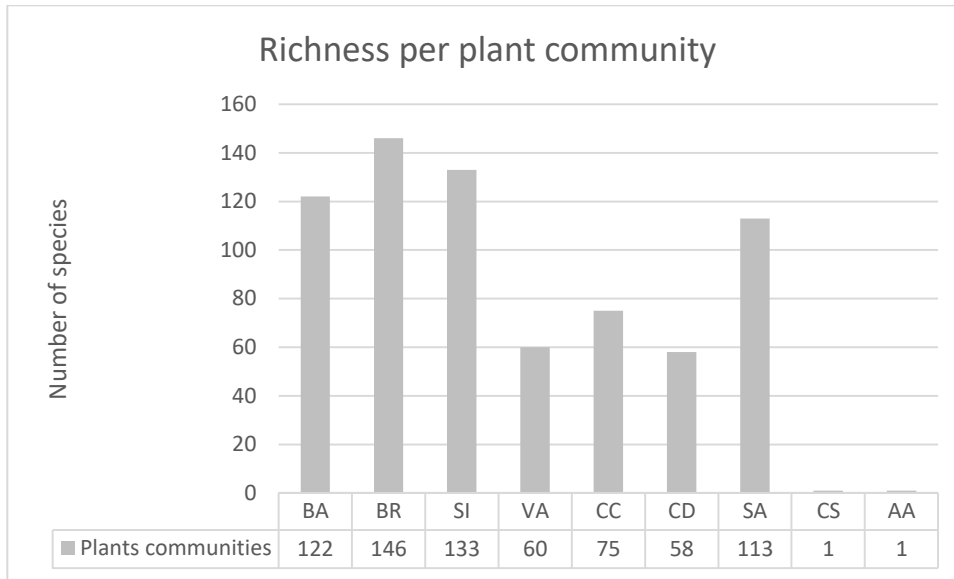
Figure 3-17 Richness of birdlife by sampling area



The natural community with the highest number of species was the BR (56%), bearing in mind it was surveyed in all properties; followed by SI (51%), BA (47%) and SA (43%) with 133, 122 and 113 species recorded in each, respectively. This distribution of records in the aforementioned communities, coincide with Tubelis et al. (2004), who suggest that the savannas adjacent to gallery forests could play an important role in the conservation of avifauna closely related to these forest formations, because, although gallery forests are relatively stable habitats in relation to seasonality, the savannas adjacent to these formations could be valuable sources of invertebrates and plant resources that compensate for the scarcity of food in the forests. Another important factor to evaluate in future samplings is the width and structure of the gallery forest vegetation, since part of the functionality and availability of resources depend on these factors when studying the bird community present in them, and also, it would comply with the provisions of Law No. 4241/2010 and its Regulatory Decree No. 9824/2012 "By which Law No. 4241/2010 for the reestablishment of protective forests of water channels within the national territory is regulated" (MAG 2012).

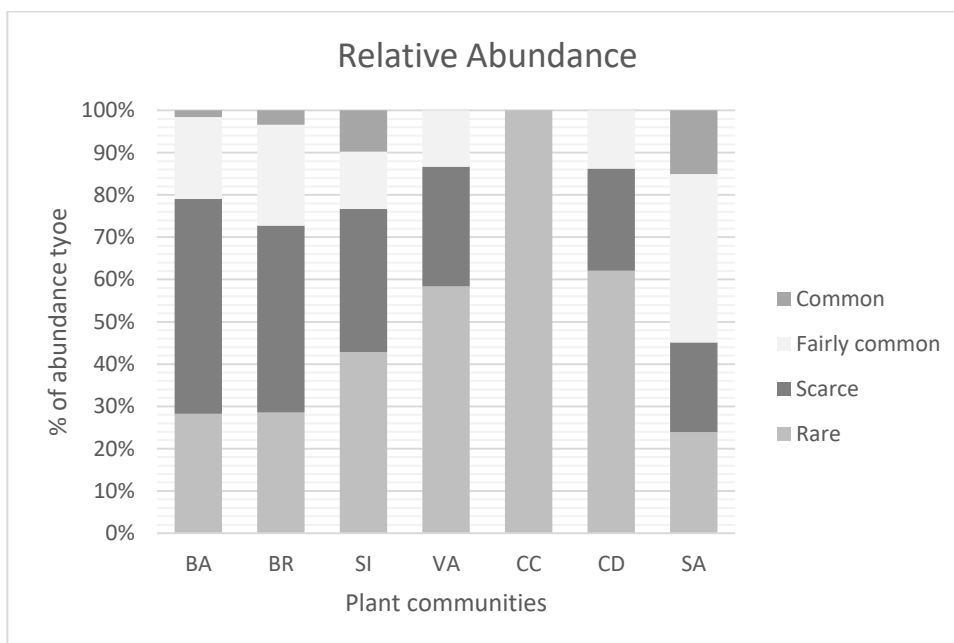
The phytophysionomies of the *Cerrado*, *Campo Cerrado* (CC) and *Cerradón* (CD) were the sites with the lowest number of recorded species (75 and 58, respectively) (Figure 3–18). The latter could be due to the fact that not all sites had typical plant formations of the *Cerrado* in a good state of conservation, and some of them were subject to fires during the monitoring, and were grazed by livestock. In VA 60 species were recorded and in CS and AA only each in each. In the natural communities of the BR, CC and SI, species under one or another category of national and international threat were found. Meanwhile, the species with migratory patterns were recorded, for the most part, in the BR (50%) and SI (30%) formations; the remaining 20% were distributed among the other communities.

Figure 3-18 Richness of birds by natural community type



With regard to the relative abundance evaluated within the 303 lists in all natural communities, a total of 4,674 individuals were recorded, with BR being the community with the most individuals counted (38%), followed by BA with 21%, SI (12%) and SA (10%) (Figure 3–19). Meanwhile, the formations with the lowest number of individuals were VA (5%), CC (8%) and CD (6%), respectively, which could be due to the fact that they have fewer lists compared to the other sites. In all the communities, the relative abundance of the species was considered rare, because they were only detected twice during all the surveys, with CC as the only community with this category of relative abundance, due to repetitions failed due to security reasons. . The other large part was scarce with more than two records, and to a lesser extent frequent and common (between three and nine records), with BA, B and SI being the sites with the most frequent species. Meanwhile, the SI and SA were the sites with the most common species (between 4 and 17 records), due to being detected on several occasions (Figure 3–19).

Figure 3-19 Relative abundance of the recorded bird species



Six species were recorded that fall under categories of threat at an international level (NT and VU), while eight species were recorded that fall under categories of threat at a national level (Threatened and Endangered) (see [Ornithology](#)) (MADES Resolution No. 254/19, Rojas et al. 2020, IUCN 2021). There were several records of a single endemic species to the Cerrado, *Saltatricula atricollis* (*pepitero de corbata*), at CC and SA in all sampling sites. In spite of being considered an endemic, this species is expanding to the south due to the savannization of landscapes in the eastern region of the country (see ornithological annex). Also, the record of *Alipiopsitta xanthops* (loro cara amarilla) another endemic species, recently documented for the country and with few records (Alvarez et al. 2012), are among the eleven species endemic to the Cerrado which occur in Paraguay according to Silva (1997). Three species endemic to the Alto Paraná Atlantic Forest, one of them nationally threatened (*Notharchus swainsonii*), and only one endemic to the Dry Chaco (*Ortallis canicollis*) (Guyra Paraguay 2004).

Forty-one species (16%) of the birds recorded are included in the CITES Appendices. All species of Psittacidae Family are included in Appendix II together with some species of Accipitridae, Falconidae and Thraupidae. Two species (*Pteroglossus castanotis* and *Sarcoramphus papa*) are included in Appendix III and *Jabiru mycteria* in Appendix I. This report includes the 59% of the psittacid species of Paraguay. This region is habitat for most of the parrot species of the country, one of the bird families with most pressure regarding illegal capture and trafficking for the pet trade, resulting in drastically reduced populations. It is for this reason that this information should be considered relevant when implementing protection and conservation strategies within the project area. Among the species of importance for conservation, *Alipiopsitta xanthops*, an endemic to the Cerrado and threatened with extinction at the local level and NT at global level; *Ara chloropterus*, one of the three species of Macaw that occur within our country, though this species is not threatened globally, it is considered Endangered at a national level (MADES Res. 254/19). This species is frequently observed and there are indications that it could be nesting within the area it was recorded, according to interviews carried out with the local population (See annex of [Ornithology](#)).

Information was gathered regarding *Anodorhynchus hyacinthinus* and *Ara ararauna*, two of the three species of macaw that occur in Paraguay. Both are considered Endangered at a national level; however, at an international level, the first species is ranked as Vulnerable (VU) while the latter species ranks under the category of Least Concern, according to the IUCN (2020). According to key informants, individuals of this species enter from Brazil to feed and descend towards the Serranía San Luis, which coincides with the frequent records from ranches near the northern edge of the Serranía San Luis National Park (Levatich & Padilla 2019, Rojas-Bonzi et al. 2020). The species was recorded nesting in some of the properties surrounding the park (Ea. Arrecife, Ea. Garay Kue as well as in San Luis de la Sierra (Rodríguez et al. 2019).

Species that have both, seasonal as well as regional migratory movements, were recorded and four states of occurrence were identified (Chart 3–1). Of the 260 species, 83% are BR, 8% are BN, four are AM and 3% BS. *Tringa solitaria* and *Falco peregrinus* are NM. Only one IB species (*Passer domesticus*) was recorded (See annex of [Ornithology](#)).

Chart 3–1 State of occurrence of the birds recorded in the area

State of occurrence		
BR	Breeding Resident	Permanent breeding resident
BN	Breeding Migrant to the North	Species that breeds in Paraguay, but is less abundant or absent during winter
BS	Breeding Migrant to the South	Species that breeds in Paraguay, but is more abundant or absent during winter
NM	Nearctic Migrant	Nests in North America during the northern summer and then migrates south during the southern spring and fall.
IB	Introduced	Introduced permanent breeding resident.
V	Vagrant, nomadic	Species with an occurrence pattern unclear in Paraguay, no nesting but of occasional presence.

Source: Adapted from Guyra Paraguay (2004).

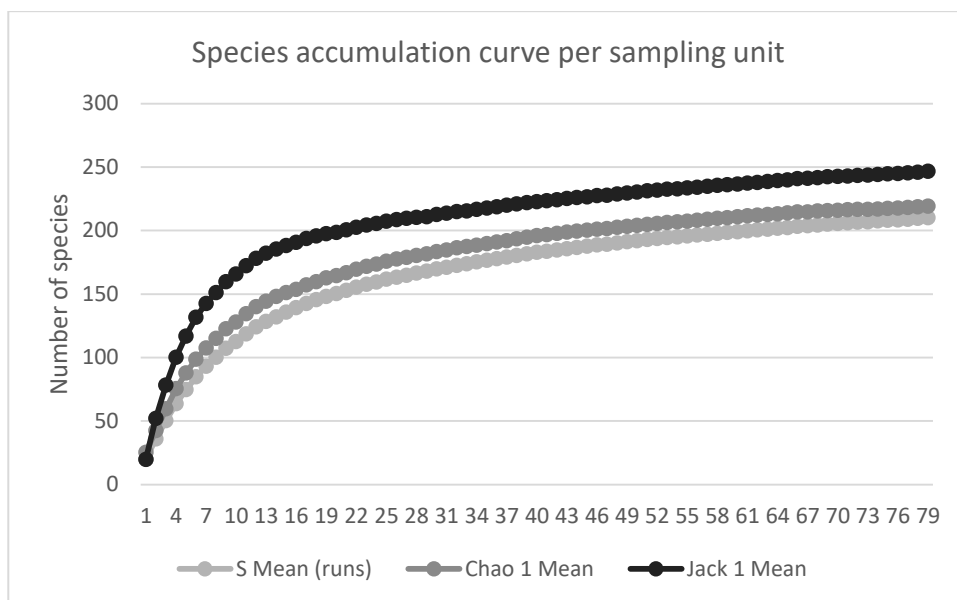
Another noteworthy species was *Pipile cumanensis*, which according to del Hoyo et al. (2019), has a distribution that ranges across the south of Venezuela, Guyana, northwestern Brazil and into the Amazon region of Colombia, Peru and Ecuador, thus leaving the subspecies *Pipile cumanensis grayi* as a species that occurs in Paraguay. In this sense, the IUCN follows the same nomenclature for its Red List but the change has not yet been accepted by the South American Classification Committee (SACC, Remsen et al. 2020). Consequently, it continues to remain as *P. cumanensis* for the country, but maintains the threat category assigned by the IUCN for *P. grayi*. It is also threatened with extinction (AE) at a national level. Records of this species in the country are distributed within the northeast of the Western region and in the departments of Amambay and Concepción. The other species of this family was *Crax fasciolata*, which is locally threatened with extinction (AE) and vulnerable (VU) at an international level. These species of the Cracidae family are more associated with BR, but can also occur in several forest communities of the *Cerrado* (BC) (MADES Resolution N°254/19, Rojas-Bonzi et al. 2020, IUCN 2021) (See annex of **Ornithology**).

Among the birds registered during the first sampling campaign, the species indicated as "hunting for self-consumption" that were found in the forest formations (*Crax fasciolata*, *Pipile cumanensis*, *Crypturellus* spp. and *Patagioenas picazuro*) are listed. Meanwhile, in grassland environments tinamous (*Rhynchotus rufescens* and *Nothura maculosa*) are listed, and in natural aquatic communities, mainly ducks (*Cairina moschata*, *Dendrocygna viduata* and *Amazonetta brasiliensis*). According to the interviews carried out with the local inhabitants, their reports coincide with Morales and Zarza (2007), where they mention that subsistence hunting is widely extended in Paraguayan territory. Meanwhile, the parrots (parrots, macaws and parrots) are the main family affected by the illegal trafficking and trade of wildlife destined for pets in Paraguay (Mendoza et al. 2015). Morales and Zarza (2007) mention that there are other uses of birdlife due to their "medicinal or ornamental properties, but whose practice is exclusively limited to indigenous groups associated with forests. Among the species known for these uses were recorded, in this survey campaign: *Rhea americana* and birds of the families Tinamidae, Columbidae, Cathartidae, Corvidae and Turdidae.

Based on the sampling effort carried out in the surveying days in the field that resulted in the registration of 260 species of birds, through 72 transects of 150 m, added the occasional species, totaling the survey in 303 lists generated in the transects during the morning and the afternoon in the different natural communities, the accumulation curve indicates that the effort is representative, since the curve tends to be asymptotic (Figure 3–20). This indicates that the number of new species that could be registered in the area is decreasing, or, in other words, a large part of the species present in the selected sampling sites were registered.

The Chao 1 estimator indicates that nine more species could be added to the 210 recorded in the transects established in the different plant communities. On the other hand, the Jack 1 estimator indicates 247 expected species as the maximum number (Collwell 2009). This last number almost coincides with the total number of species recorded inside and outside the transects in all the sampling units evaluated during the sampling campaigns (260 species).

Figure 3-20 Species accumulation curve for birds recorded in the field campaign in Parcel Properti



The Simpson index value was 0.988 (maximum value 1), which indicates a high probability that two individuals of different species are registered, therefore the sites sampled during the campaigns present a high diversity, taking into account the sampling effort made.

The value of the Shannon-Wiener index obtained was 4.8, being the maximum value estimated for the sampling data of 5.2, which indicates that the species were uniformly represented, considering all the sampled species which could indicate that the diversity of birds is high in the sites sampled.

3.8. Mammalian survey

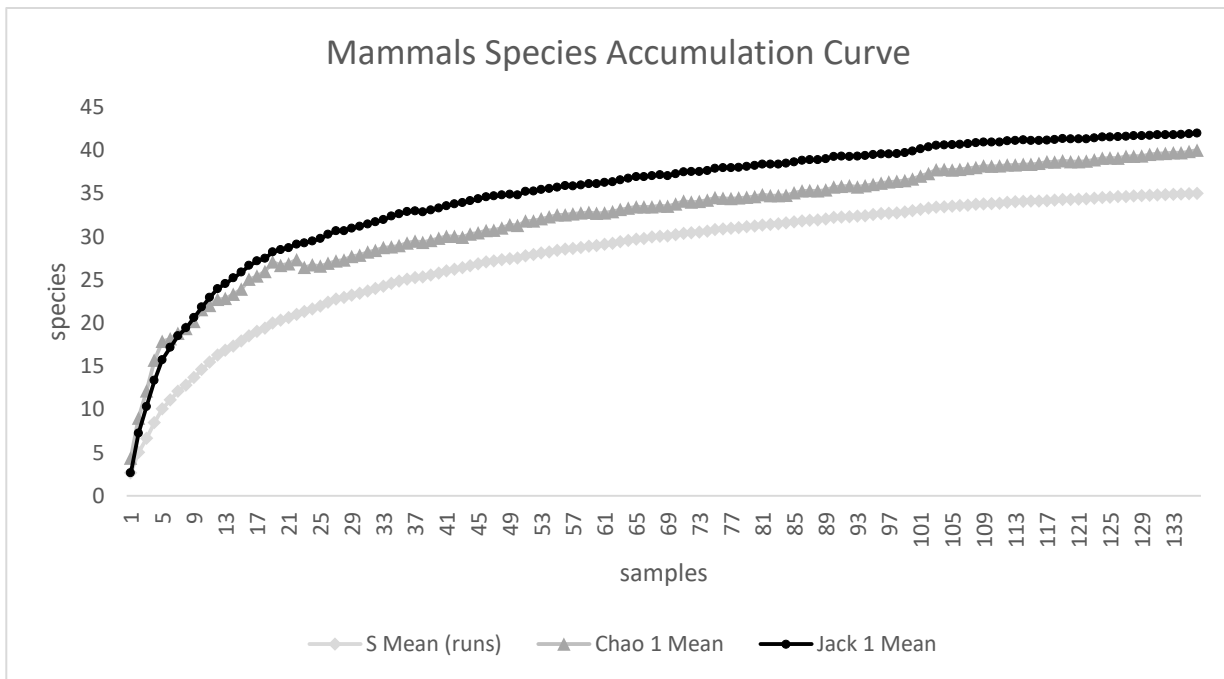
A total of 63 mammal species were recorded, 38 corresponding to 10 orders and 20 families in a first instance and later with a special effort focused on bats, 25 species were added (See detailed information in [Mammalogy](#)). This represents 31% of the species, 100% of the orders and 50% of the families present in Paraguay; it also represents 35% of the species listed as possible. Furthermore, signs of at least three taxa found that could not be identified at species level, as well as two rodents were recorded on camera traps whose identification remains totaling at least five unidentified species.

This indicates that 42 mammal species are recorded directly or indirectly during this survey. The following analysis is referred to the general surveys of mammals developed in first instance and followed by a deeper based on the survey and findings of bat monitoring.

A total of 35 species were recorded directly with the systematic sampling, included the species undetermined what represents 83% of the 43 taxa recorded. On the other hand, eight species were recorded indirectly, among them species elusive species such as *Ozotoceros bezoarticus* (Pampas Deer) and *Chrysocyon brachyurus* (Maned wolf), and species of importance for conservation such as *Panthera onca* (jaguar).

The species accumulation curve generated by sampling with camera traps and linear transects (Figure 3–21) indicates that the survey tends towards an asymptote, but that the richness will continue to increase with greater sampling effort. Using only direct records, the Chao 1 richness estimator presents a mean value of 39.9 (95% CI: 34.6 - 52.8), while the Jackknife 1 estimator presents a mean value of 41.9. According to these estimators, during the survey between 83.4% (Jack 1) and 88% (Chao 1) of the species that could be recorded with the same sampling effort were recorded.

Figure 3-21 Species accumulation curve for mammals and richness estimators per sampling unit

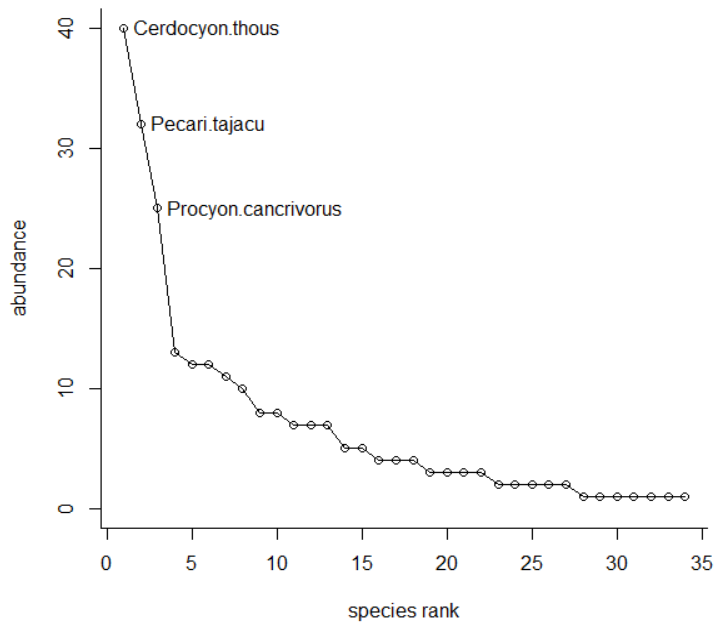


Of all the mammals recorded, the order Carnivora is the best represented with a total of five families and 13 species; the Felidae family has the most species (5). The order Rodentia is the second best represented, with a total of five families and seven species recorded. Furthermore, 100% of the representatives of the families Myrmecophagidae, Leporidae, Procyonidae, Tapiridae, Dasyproctidae and Cuniculidae in Paraguay were recorded during this survey.

On the basis of direct records, *Cerdocyon thous* (zorro de monte) is the most abundant species observed, followed by *Pecari tajacu* (collared peccary) and *Procyon cancrivorus* (osito lavador) (Figure 3–22). Other frequently occurring species include *Tapirus terrestris* (tapir), *Dasypus novemcinctus* (mulita grande), *Sylvilagus brasiliensis* (conejito de monte) and *Hydrochoerus hydrochaeris* (capybara).

Records of deer (*Mazama gouazoubira* and *M. americana*) are also quite frequent; however, most of the tracks are not attributable to any one of the two species (Angeli et al. 2014) due to the variability in size of the individuals, making it difficult to determine their specific abundance. On the other hand, *Desmodus rotundus* and *Platyrrhinus lineatus* (bats), *Cavia apera* (cuis), *Sapajus cay* (capuchin monkey), *Leopardus braccatus* (pantanal cat), *Leopardus pardalis* (ocelot) and *Coendou prehensilis* (large porcupine) were the species with the least direct records made.

Figure 3-22 Rank-abundance curve for the mammal community recorded during sampling



The observed species richness varied according to the sampling areas and the natural communities sampled (Figure 3-23). Among the AM, Gavilán is the one with the highest species richness with 70% of the registered species. On the other hand, among the natural communities, the BR is the one with the greatest wealth observed with a considerable difference with the wealth observed in other natural communities. It is worth mentioning that the CS community was not included in the figure because there were no traces attributable to any species; however, trails and burrows were observed in this community. In relation to seasonality, richness was higher in the humid (summer/rainy) season (Figure 3-24).

Figure 3-23 Observed richness by sampling area (AM) and natural community

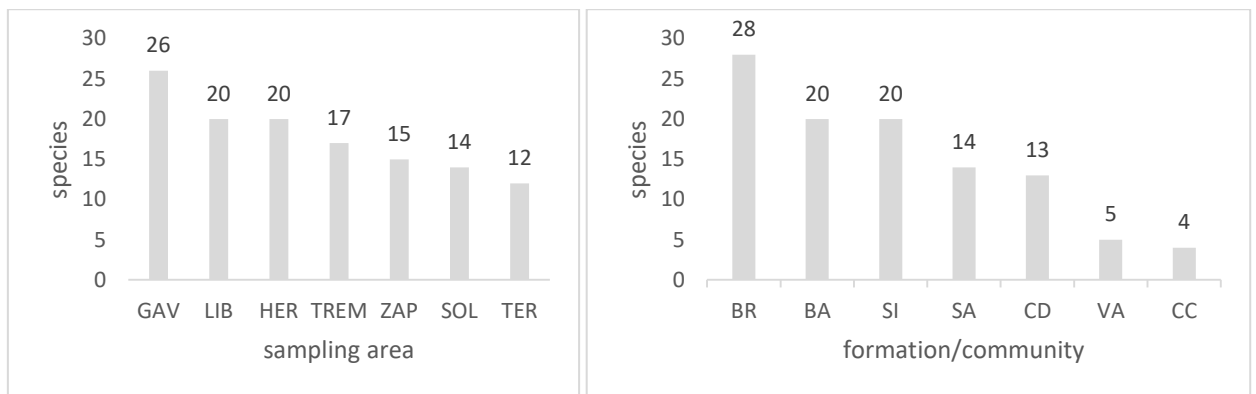
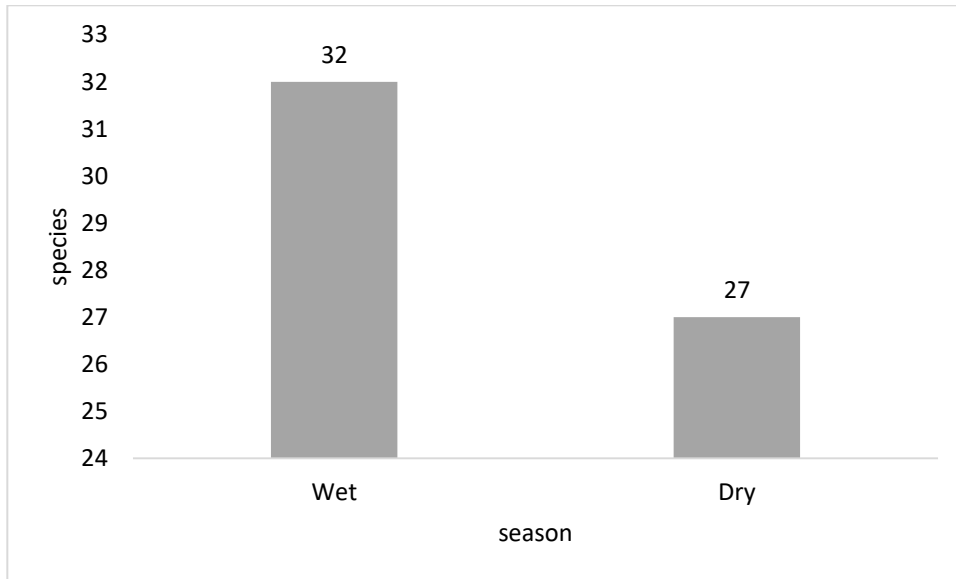


Figure 3-24 Number of mammal species in rainy and dry seasons.

The structure of the mammalian communities presented variations in the different plant communities. It was observed that the crab-eating fox is the dominant species in terms of abundance in three of the four analyzed plant communities (BR, SI and SA), while the collared peccary is the dominant species in the BA formation, in the one with the fox in second place. It should be noted that two armadillos presented high abundances in the SA community.

Table 3-2 Shannon and Simpson Indexes for mammals per plant community

Indicator (mean)	Plant community				
	All	BA	BR	SA	SI
Taxa/Richness (S)	35	22	27	14	18
Individuals	463	44	83	37	46
Simpson (1-D)	0.91	0.897	0.93	0.88	0.898
Shannon (H)	2.87	2.54	2.93	2.38	2.55

According to the estimated values of the Shannon (H) and Simpson (1-D) indexes for the different plant communities, the uncertainty in predicting a species taken at random in the sample is measured, so it increases as it increases. The representativeness of the species in the sample, that is, it increases with diversity (Magurran, 2004). The Simpson index (D) is a measure of the dominance that a few species present in the analyzed community, that is, the calculated value decreases as diversity increases; For this reason, it is intuitive to use the complement of this index, or the Simpson diversity index (1-D), which is a measure of the degree of equity between the species present in the community (Magurran, 2004). According to the values calculated here, the plant community with the greatest diversity of mammals is the BR.

Regarding species of importance for conservation and of scientific interest, we can highlight the records of *Panthera onca* (jaguar), Near Threatened (NT) internationally and Critically Endangered (CR) in Paraguay, as well as *Chrysocyon brachyurus* (maned wolf), NT under the IUCN and Vulnerable (VU) at the national level. Both species have been recorded indirectly based on the reliable testimonies from local people. Other records of interest include *Leopardus braccatus* (*gato del pajonal*), NT under the IUCN and Data Deficient (DD) at a national level; *Leopardus pardalis* (ocelot), NT in Paraguay; and *Myrmecophaga tridactyla* (giant anteater), *Tapirus terrestris* (tapir) and *Tayassu pecari* (white-lipped peccary), these last three being VU both at national and international levels. Among all the species recorded, eight fall under some category of national or international threat, two are considered DD (lacking data for evaluation) at the international level and two at the national level, while one species (*Sylvilagus brasiliensis*) is not evaluated due to recent changes in its taxonomy. Furthermore, 18 of the recorded species are found in one or another of the CITES appendices.

Regarding the specialized sampling of bats, a total of 26 species were registered; six species by direct method (mist nets), one species by occasional record (*Platyrrhinus lineatus*, in the AM Zapallo), 17 species by the acoustic method and with both methods two species ([Richness by species in sampling sites](#) See Table). The five species common to all the sampling areas were *Lasiurus ega* and *Lasiurus blossevillii* of the family Vespertilionidae; *Molossus rufus*, *Nyctinomops laticaudatus* and *Eumops* sp. of the family Molossidae, all belonging to the insectivorous guild. Seven species were only recorded at one site: *Artibeus lituratus* (AM Soledad) and *Platyrrhinus lineatus* (AM Zapallo), both frugivorous species; *Glossophaga soricina* (AM San Liberato) nectarivorous species; *Nyctinomops macrotis*, *Cynomops planirostris* and *Molossus* sp. (AM Turpentine) an insectivorous species and *Noctilio leporinus* (AM Hermosa), an ichthyophagus (see [Bat community](#)). The sampling effort carried out in the direct method following the calculation methodology of Straube & Bianconi (2002) was 18,900m²h. The acoustic record generated through the SM4BAT and the Echo Meter Touch Pro 2, 77 and 4.7 hours of recording, adding 8,102 and 1,136 records, respectively. Both methodologies are necessary for bat monitoring, since, as mentioned above, insectivorous groups are less likely to be captured in mist nets, unlike frugivorous species that, due to the type of flight, can be captured more easily with mist nets. Both methodologies have been successfully implemented in collecting species data (Pech-Canche et al., 2010; Delgado-Jaramillo et al., 2011; Zamora-Gutierrez et al., 2016).

With the implementation of the two methodologies for monitoring of chiropterofauna, 75.75% of the total species described for the area were recorded (33). Two species of those recorded by the bioacoustics method are found with Vulnerable Conservation Status (VU) and Data Insufficient (DD) at the country level, *Peropteryx macrotis* and *Saccopteryx leptura*, respectively. There are no official records of *Saccopteryx leptura* in the area, and the collection of the specimen would be required to obtain a control material of the species in situ; however, the probability of the presence of this species in the area is very high and should be taken into account in future research. In relation to the abundance and richness of species, it was estimated, according to the Shannon diversity index, that Soledad AM (2.26), Trementina (2.18), and San Liberato (2.11) are the sites more diverse based on species equity (See Table in [Bat community](#)). The Shannon index coincides with the total of species registered in each site where the AM Trementina and Soledad contain the highest number of species (17), followed by AM San Liberato (16). These results also coincide with the presence of water bodies surrounded by native vegetation, considered characteristic habitats conducive to the presence of bats. Regarding the Simpson diversity index, it can be observed that in the Zapallo (0.47) and Hermosa AMs (0.58) they are among the most diverse.

This index also allows observing the estimation of dominance of each site, being AM Soledad (0.87) and San Liberato (0.85) the ones with the highest dominance of species. The estimation of the diversity indices helps to visualize the importance of each site and not just the number of registered species. It is observed that the estimators used (Chao2 and Jack1) contemplate that with a greater sampling, the estimated 32 species for the study area would be reached (see The Chiroptera community). In this way, a total of 26 species were recorded at the seven sampling points during the seven nights, corresponding to 81.25% of the species described for the area according to the estimators used.

3.9. Preliminary results with the eDNA analysis

NatureMetrics (2021)² has presented a preliminary result of the analysis of 115 samples collected. These samples showed evidence for 357 taxa with an average taxonomic richness of 39.9 (4 to 90) with the most abundant sequence for *Pimelodella* sp., and the most commonly detected species being *Hoplias* sp. This analysis resulted in the identification of five species of conservation concern (NT - Near Threatened on the IUCN Red List). These five species were two bird species the Turquoise-fronted Amazon (*Amazona aestiva*) and the Greater Rhea (*Rhea americana*) and three mammal species, the Neotropical Otter (*Lontra longicaudis*), the Naked-tailed Armadillo (*Cabassous chacoensis*), and the Black-and-gold Howler Monkey (*Alouatta caraya*). These are the species mentioned in the report while it is referred that 39.5% (141 taxa) of the data obtained could be assigned to species level (at least 99% similar to a species in the global reference databases) though additional species names were not disclosed yet for these taxa. The remaining taxa were identified to the lowest possible taxonomic level: 40% to genus (143 taxa), 9.8% to family (35 taxa), and the remainder to order (38 taxa). All the reported orders and family in the report have been also detected in this study. The report advances that the taxon count per class was: 195 fish, 30 amphibians, 78 birds, 50 mammals, and 4 reptiles. Once the detailed analysis is disclosed, a cross reference could be developed with the species identified by traditional methods and this could enrich the biodiversity baseline information.

² NatureMetrics. 2021. Preliminary Metabarcoding Results. Paracel S.A., 11 pp.

4. DISCUSSION

Overall, the findings of this study exceed the expectations in terms of creating a biodiversity baseline for both flora and fauna carried out over the 29.5 of effective field work both in flora and fauna monitoring. These monitoring days resulted in an investment of 4.21 days per sampling area for both seasons. The evidence given by the complementary species shows the rich biodiversity for the study area.

A total of 700 plant species, belonging to 97 botanical families were recorded: 22 pteridophytes, 139 monocots, 539 dicots. The study made it possible to survey and classify the plant formations of one of the most threatened and less known ecoregions at a country level, despite its importance at a regional and global level. The current knowledge of its biodiversity is based mainly on floristic studies dating back more than 100 years. The most recent studies were carried out within the last three decades, and were mainly based on the application of the REA methodology in preparation for the Technical Justifications and draft Management Plans for Protected Areas. There are also a few floristic studies of specific taxa that have been carried out by local and foreign specialists.

Despite the fact that the *Cerrado* formations in Paraguay occur as isolated mosaics within various ecoregions -such as Alto Paraná, Amambay and principally the Aquidabán (MADES 2013) in the Eastern Region of the country, as well as the *Cerrado* ecoregion in the Western Region- many typical species are common among them, although some are exclusive. Regarding the floristic diversity of the formations corresponding to the Cerrado phytophysionomies represented by the Cerradón, Campo Cerrado and Campo Sucio, in a comparative study carried out with 411 of the 700 species registered for the study area (which includes those identified by genus and morphospecies), it was found that there is a floristic affinity of 30-57% between these and the phytofisionomies of the Cerrado present in the departments of Canindeyú and Concepción. It was compared with the studies carried out by Peña-Chocarro et al. (2010), in the Mbaracayú Forest Nature Reserve, SEAM/UNDP/GEF (2006) in the Paso Bravo National Park, and Rojas Bonzi et al. (2020) in the Serranía San Luis National Park, when analyzing only those identified up to the species level of the 282 species recorded within the PARACEL project area (December 2021 campaign), we can confirm that the majority of them are in common. There are 162 species (57%) in common with the Mbaracayú Forest Nature Reserve, 127 species (45%) in common with the Paso Bravo National Park, and 85 species (30%) in common with the Serranía San Luis National Park. The complete list of analyzed/determined species is included in the [Vegetation and Flora](#).

The formations of savannas and especially those that are linked to water (periodically flooded, flooded or with permanent water), are dynamic ecosystems, whose species - mostly annual, biannual or perennial herbaceous - are adapted to fluctuations in water and other environmental factors that determine the presence or absence of species in different seasons. Due to their floristic diversity and the presence of water, these sites are places of passage and feeding for the local fauna, which contributes to the pollination and dispersal of plant species.

In the flooded savannas, which generally develop in the lower portions of the land, it is possible to find variants with water (marshes, swamps, bodies of water) and without water (dry savannas), disparities that would also influence the richness of species found. The presence of "Islets" in this formation adds a floristic diversity, mainly woody ones, which play a very important role for the local fauna, such as provision of perch, nesting and feeding place, refuge, etc. In the main matrix, these islands generally occupy the highest parts of the terrain. For more information on this matter please see [The islets of forests](#).

Mereles (2007) affirms forests are formations that exceed 5 m in height. In their vertical structure, they can have 3-4 strata of vegetation, reaching the primary layer or higher at a maximum height of 25 m. In most of them, the height of the trees in the first canopy no longer exceeds 15-18 m. In its horizontal structure there are several forms of life, such as: various herbaceous, shrubs, vines, epiphytes and trees; according to the geographic location where they are. In the case of the forest remnants studied, the riparian or marginal forest was the one that presented the greatest floristic diversity, compared to the high degraded forest, probably due to the degradation (extraction of timber) observed in the latter, in addition to the greater applied sampling intensity. In the Riparian or Marginal Forest, apart from the typical species of this formation, floristic elements belonging to the Cerrado phytophysionomy were recorded.

The fact that, although the study area is located at the extreme northwestern distribution of the Alto Parana Atlantic Forest (BAAPA), more than 40% of the tree species registered in the forest formations, High Forest and Riparian Forest, are common to the BAAP (Spichiger et al. 1992). On the other hand, it is important to point out that some species such as *Amburana cearensis* (clover), *Myroxylon peruiferum* (red incense) and *Syagrus oleracea* (guaviroba), are typical of the Cerrado Ecoregion, with a restricted distribution in the country.

Although there are recent studies and literature that make reference to the presence of several endemisms (Pena-Chocarro & De Egea 2018), as well as important plant genetic resources (De Egea et al. 2018) for food and agriculture -aspects of great importance and relevance worldwide- a more detailed analysis is required for a better assessment of the floristic resources present in the study area based on the high potential they represent; this, however, is beyond the objective and scope of this biodiversity baseline.

Among the four taxa evaluated, 438 species of vertebrates were recorded (81 fish, 59 amphibians & reptiles, 260 birds and 38 mammals), corresponding to 110 taxonomic families with some additional species of invertebrates. The collected species information of fauna presents all the necessary evidence for their confirmation within the site, thus making an innovative contribution towards the knowledge of this transitional area between the *Cerrado* and the Humid Chaco and Atlantic Forest.

With regard to the ichthyofauna within the study area, we can mention the records of an additional 13 species of fish to the number already documented for the Aquidabán River (Insaurralde et al. 2012). Nevertheless, these lists share three species (*Charax leticiae*, *Moenkhausia dichroua* and *Pyrhulina australis*) between both places. The diversity of herpetofauna is considered to be high, and the use of transects for the active search of amphibians & reptiles is one of the most useful and feasible methods for rapid assessments and to get a get an idea of the composition of an area.

Regarding the threatened species, the anurans *Rhinella scitula* and *Dendropsophus elianae* are endemic species to the *Cerrado*, which also have their general distributional limits within the country. On the other hand, the reptiles *Chelonoidis carbonaria* and *Caiman latirostris* present other conservation challenges. These latter four species -two frogs, one tortoise and one caiman- could be the indicator species for the herpetofauna of the site.

Of the 460 documented species of birds (historical and recent records) for the Concepción Department (eBird 2020), 260 species (56.4%) were recorded during the best time of year for birdwatching, coinciding with the end of the breeding season for Neotropical birds (Hayes 2014) and for this most of the species were found active and also austral nesting migratory birds which initiate their migration to the north at the end of the summer in the Southern Hemisphere (Guyra Paraguay 2004). We had expected to find more endemic species cited for the *Cerrado* in Paraguay (Silva 1997), though endemic species of other ecological regions were recorded such as those of the BAAPA and the Dry Chaco. Similarly, it was expected to record other species associated with plant formations and natural communities typical of this ecoregion, such as seedeaters (*Sporophila* spp.) and other birds associated with natural grasslands and savannas, as well as other species of Macaw that could inhabit the area. This absence could respond to the modification of native grasslands habitats for productive activities (areas in which the woody vegetation - shrubs and coco palms, is removed, implanted forests, etc.) which could affect the availability of proper habits for these particular species. Despite this situation, several individuals of *Rhea americana* were recorded in all sampled sites within diverse habitats with natural grasslands or sabanoid-like environments ; this species conservation status is NT globally, as well as other species which are dependent of open areas such as *Seriema cristatan*, *Nothura maculosa*, *Rynchotus rufescens*, and those of floodable or humid savannas such as *Emberizoides* spp. and particular seedeaters occurring in these Cerrado formations as the savannas of tall grasses, among them *Sporophila plumblea*, recorded in the dry season monitoring.

Nevertheless, it is worth mentioning that other species of interest that occur in the *Cerrado* were also found, which fall under different levels of national and international conservation status, in addition to the species that use this area as a stopover within their regional migratory routes, as well as other lesser known and under-recorded species in the region that use the habitats available at the site to complete their biological cycles. These are potential indicator species of the environmental quality and current condition of the study area. Among these species of interest, we can mention the Red Macaw (*Ara chloroptera*) which stands out as the flagship species of the *Cerrado* and in danger of extinction at a national level, given that this ecoregion is one of the last relics with the presence of a free population. Fifty-nine percent of the country's parrot species were recorded in the area and this entire order is included in Appendix II of CITES; they deserve certain protection actions related to trade, in order to avoid the reduction of their free populations. This is the family with the highest number of species of conservation concerns both at global and local levels; among them *Alipiopsitta xanthops*, endemic to the Cerrado, Endangered and NT. Both Psittacidae may be considered flagship species for the study area. *Crax fasciolata* and *Pipile cumanensis* are other species of interest, since the presence and abundance of both could indicate the quality of their habitat (mature forests and riparian forests), as well as help to evaluate their conservation status (Laíno et al. 2018). *Crax fasciolata* is threatened with extinction at a local level and Vulnerable at an international level, meanwhile *Pipile cumanensis* is Near Threatened at an international level, mainly due to habitat loss, unregulated hunting, and to a lesser extent, captured as pets. There are few studies of these species in Paraguay; consequently, their monitoring could be key to the design of strategies for their conservation.

We can highlight the findings for the order Carnivora, with the highest level of representation, and the Felidae family in particular with the observation of five of the eight species of felines in Paraguay. This phenomenon could reflect that the carnivore community, and therefore its prey, are in good condition; however, more profound studies should be carried out to better understand their conservation status.

All the species recorded during this campaign were “expected” for the area, with the exception of *L. braccatus*, whose record comes as a surprise considering the known distribution of the species (Nascimento et al. 2020), which reveals how poorly studied the mammalian fauna is in the region. The observed richness at each of the different localities does not necessarily reflect their true richness; for example, in the case of San Liberato and Hermosa with little sampling effort, we found a high species richness, what indicates these areas are very used by mammals. Something similar happens with the various natural communities, where the observed richness does not necessarily reflect the actual richness of these communities. This is due to the fact that the collection of data has different levels of effectiveness for the various communities and the sampling effort was not equal in all the communities explored. In rocky soils and grasslands for example, the likelihood of species detection by signs and prints was low, most of the records found in these sites were burrows in termite-hills (*takuru*), feces or prints in clearings where mud was present. One common problem was the permanent presence of livestock prints prohibiting this to detect mammals’ trails. Species with few records (sightings), such as the cuis (*apereá*), the porcupine, the bats and the capuchin monkey, do not reflect the true abundance of these species since they are difficult to detect due to their habits, as well as the type of sampling implemented. On the other hand, it is highly likely that the pantanal cat has a very low abundance, taking into consideration that its "rarity" and elusive nature are widely known (Pereira & Aprile 2012).

From the data obtained and the corresponding analyzes, it can be concluded that the mammal community is widely dominated, in terms of abundance, by the crab-eating fox (*Cerdocyon thous*) in all the analyzed plant formations, with a co-dominance with the collared peccary (*Pecari tajacu*), and crab-eating racoon (*Procyon cancrivorus*) when it comes to plant formations associated with water. In forested areas, however, higher species richness and an almost exclusive presence of felines and primates were regularly found. In open areas (savannas and implanted pastures), the mammal community was also dominated by the bush fox; however, it was found that these areas are widely used by armadillos (*Euphractus sexcinctus*, *Dasyus novemcinctus* and *Cabassus unicinctus*) and anteaters (*Myrmecophaga tridactyla* and *Tamandua tetradactyla*). These species especially take advantage of the almost ubiquitous presence of the *takuru* in open areas. In the case of anteaters, they use open areas mainly for feeding; but, on the other hand, armadillos also use these areas to make burrows, which can be found in abundance both in implanted pastures and in high and flooded savannas. Other mammals also use open areas, such as deer, peccaries, and felines. However, in the case of felines (puma, ocelot, jaguarundi, etc.), all the records were obtained near waterways or forests with seasonal lagoons, which allows us to establish the hypothesis that they would have a marked preference through wooded and open areas near riparian forests or tall forests.

Among the species mentioned by the people interviewed, we can mention the jaguar (*Panthera onca*), the maned wolf (*Chrysocyon brachyurus*), the Pampas deer (*Ozotoceros bezoarticus*) and the otter (*Lontra longicaudis*). These have been included in the list of recorded species considering the high probability of occurrence and the reliability of the testimonies. In the case of the jaguar, five people reported seeing the species in different sites within Paracel properties. The identified site is located within the Zanja Moroti ranch (22°35'49.29"S, 57°2'1.10"W), roughly 100 meters from a watercourse in an area with considerably large forest patches, Trementina (22°44'10.28''S, 56°54'37.43''W) and San Liberato (22 ° 36'46.51 "S, 56 ° 53'18.23" W). Jaguar tracks were found in two of these locations (see photos in [Mammalogy](#)) and additionally one of the people who reported the species showed the team a photo of an attack on a calf that meets the specific characteristics of this species. For this reason, *Panthera onca* is considered an indirectly recorded species, until direct photographs were obtained.

It is likely that this species is represented by one or very few individuals in the area, and uses the large patches of forest found on and outside the Parcel properties as a refuge. Likewise, it is possible that its movement is almost exclusively nocturnal between these patches and the riparian forests found in the area, so its probability of detection is very low.

Furthermore, the maned wolf (*aguará guasú*) was also reported by two people at different times in the same area, just north of the Estancia Soledad ranch, bordering the Paso Bravo National Park, additionally, during the dry monitoring activities, a maned wolf footprint was recorded in Santa Teresa. Estancia Soledad also happens to be the same ranch where the howler monkey was recorded. The otter was reported by several people in different areas, but always linked to watercourses; the species was sighted in Santa Teresa and Hermosa by the team members. Both the jaguar and the maned wolf could be flagship species, so it is extremely important that efforts be made to document their presence and monitor the use they make of the territory.

Descriptions of species that could not be fully identified were also received; for example, the “*tirika’i*”, which refers to a cat of the genus *Leopardus*, which based on distributions and citations could be either *L. guttulus* (Nascimento & Feijó, 2017) or *L. geoffroyi* (Cuyckens et al., 2015). Both species are cited for the area in other data collections for fauna, but there is no documentation to support these records. The mention of this record deserves attention because both possible species are included in Appendix I of CITES and, furthermore, *L. guttulus* is categorized as Vulnerable at both national and international levels. Other probable species of conservation interest, such as the giant armadillo (*Priodontes maximus*) and the bush dog or *jagua yvyvy* (*Speothos venaticus*), were not recorded, neither directly nor indirectly through interviews. These three species fall under some category of national and international threat, and could be flagship species if their presence were confirmed in the area. A number of other species are cited for the area, but these were not detected during the surveys carried out during this first fieldwork campaign; these are, for the most part, marsupials, bats, and rodents. This is because the methodology and the sampling effort were mainly focused on medium and large mammals. Among the recorded species, six have been identified as being of special interest for conservation. Ecological aspects are briefly described for each, following Parera (2017) and Canevari & Vaccaro (2007), meanwhile their current conservation situations and main threats are based on IUCN (2021) and APM & SEAM (2017). These species are the jaguar (*Panthera onca*), the ocelot (*Leopardus pardalis*), the maned wolf (*Chrysocyon brachyurus*), the anteater or *yurumí* (*Myrmecophaga tridactyla*), the tapir or *mborevi* (*Tapirus terrestris*) and the white-lipped peccary or *tañycati* (*Tayassu pecari*). A summary of each of these six species is included in the [Mammalogy](#).

The effort especially aimed at bats, allowed to know more about this community since there is no published inventory in the study area; however, according to the work carried out to date (López - González et al., 1998; Gorresen & Willig, 2004; López-González, 2004, 2005; de la Sancha et al., 2017), it is estimated that there would be 33 Chiroptera species. Through the indirect methodology there were records of species, mostly insectivores, as highlighted in the literature regarding this guild with respect to the echolocation system and they can be more easily detected by acoustic recorders; in addition, a fish-eating species could be recorded with this method. Likewise, foraging activities could be identified in all sampling sites, which demonstrates their importance as a source of food resources for bat species. Vocalizations of bats that were not identified by the software or confirmed by the literature were documented as sonotypes.

Sonotypes are those vocal signatures that cannot be recognized, but are clearly different and can be grouped into different families and genera (Ochoa et al. 2000). The probability of other species present, even unrecorded for the area, is very high, so the development of more studies in the area should be taken into account and the two techniques used in this work (direct and indirect) must be combined. In Paraguay, knowledge about bats is incipient and scarce, so the work carried out with this group of mammals (such as the present study) is of utmost importance and yields novelties such as new records for the area, in this case that of *Saccopteryx leptura*, of the Emballonuridae family. This species, although it is listed by the IUCN as of Least Concern (<https://www.iucnredlist.org/species/19807/22005807>), reaches the limit of its distribution in Paraguay, and in the Red Book of Paraguay (Red Book of Mammals of Paraguay, 2017), is cataloged as DD; that is to say, of concern about the information gaps on the species. The other species registered (by the bioacoustic method) of the Emballonuridae family, *Peropteryx macrotis*, is also recorded for the IUCN as of Least Concern (<https://www.iucnredlist.org/species/16709/22101100>), but in the Paraguay Data Book of Paraguay (Libro Rojo del Paraguay, 2017), is classified as vulnerable (VU), because it has an extremely restricted distribution and few records of it are known in the country. Additionally, there are no updated records of this species in Paraguay.

The presence recorded of Phyllostomidae bats (*Carollia perspicillata*, *Artibeus lituratus*, *Artibeus planirostris*, *Glossophaga soricina*, *Platyrrhinus lineatus*) considered regenerators of secondary forests (because they disperse seeds and pollinate flowers of pioneer plant species in forests) (Gorresen & Willig, 2004), reveal a good ecosystem health of the study area that allows the recovery of the system in the medium and long term. In general, the results obtained are relevant for the sampling areas, since it allowed the registration of most of the species described for the area, belonging to five different families of the six present in the country (Phyllostomidae, Vespertilionidae, Molossidae, Emballonuridae and Noctilionidae). Regarding the richness of species, this is satisfactory, taking into account the sampling nights and the limitations when choosing the sampling points. It is estimated that species richness and novelties could increase as more areas are sampled and sampling repetitions increase, especially those far from the properties' headquarters, where there are native forests with different levels of degradation.

The innovative eDNA³ developed by Paracel in its preliminary finding adds a species which has not been referenced or recorded during the survey and this is the Naked-tailed Armadillo (*Cabassous chacoensis*), which once the full report is obtained, should be incorporated into the final list of mammal species. The other four species of global conservation concern have been already identified in the field surveys, except for the confirmation of the Neotropical Otter (*Lontra longicaudis*); while the Turquoise-fronted Amazon (*Amazona aestiva*), the Greater Rhea (*Rhea americana*) and the Black-and-gold Howler Monkey (*Alouatta caraya*) have their presence confirmed by the conventional methods. For the species of fish, the most abundant sequence for *Pimelodella* sp., is to be contrasted with the three species identified in this study, while *Hoplias* sp the most commonly detected species may be contrasted with *Hoplias misionera*. The final report will elucidate information on information for 195 fish, 30 amphibians, 78 birds, 50 mammals and 4 reptiles.

³ NatureMetrics (2021)

Although fungi were not the main focus of this study, the presence of specialists was used to identify some specimens found. The description of the genera cataloged in this short survey showed that the number of species can be much higher, especially in the Riparian Forest (BR). Although the Cerradón species are of great importance, they are minor in occurrence. Fungi are natural bioindicators, which is why the occurrence of fungal species is associated with plant species. The mutualistic natural interactions between living organisms in forests are of vital importance, since some plants depend on these interactions for their existence. A larger and exhaustive sampling of fungal species is highly recommended to obtain more data on the fungus / plant coexistence and for the preservation of suitable environments for both types of organisms. With a larger and representative sampling, which covers all the identified plant formations, it will be possible to know the mycobiota in an integral way and thus study its interaction and importance, whether ecological or even for the use of resources in sustainable development.

Final report.

Biodiversity Baseline Study of Parcel Properties. Parcel S.A.
May 2021.

5. CONCLUSIONS

The study area was found with moderate to high anthropic disturbance; nevertheless, the first campaign of a rapid seasonal survey (rainy season) of the fauna and flora was carried out, fulfilling the objective of providing the first records for the resulting baseline and for future evaluations.

The 700 species of plants and 438 species of vertebrates recorded (besides the 40 species of fungi and other species of invertebrates) reflect the great potential of this site for conserving elements of the *Cerrado*, as well as other ecoregions that converge at this point, such as the Atlantic Forest and the Lower Chaco (Humid Chaco). Out of flora and fauna taxa, the diversity of fungi and invertebrates is still far from being known.

This study made it possible to survey and classify the vegetation formations of one of the most threatened, and yet lesser-known ecoregions at the country and global levels. The current knowledge of its biodiversity is based mainly on very old studies, dating back more than 100 years. The most recent studies date back from over the last three decades, mainly carried out applying the REA methodology and other floristic studies of specific taxa. This work reviews these studies and contributes towards the species expected to be found.

Although the *Cerrado* formations are present in the country as isolated mosaics within various ecoregions such as Alto Paraná, Amambay and mainly Aquidabán in the Eastern Region, as well as the *Cerrado* ecoregion in the Western Region, many typical species are common among them, while others are exclusive.

In spite of recent studies and publications that refer to the presence of various endemisms (Pena-Chocarro & De Egea 2018) as well as plant genetic resources (De Egea et al. 2018) of importance for food and agriculture -aspects of great importance and relevance worldwide- a more detailed analysis is required that falls outside the scope of this biodiversity baseline. The same applies to the fauna discussed throughout the different sections.

The study area is considered one of the hot spots of the dendroflora of Paraguay by Spichiger et al. (1995), for constituting the meeting point between two different Floras, that of the *Cerrado* and that of south-east and south Brazil (Flora of the *Cerrado* and Flora Paranaense). Indeed, from a comparative analysis carried out with the 228 tree species that these authors mention as typical of these Floras, it was found that 59 of them (25.9%) are present in the study area. Of these, 37.3% are common to the Pleistocene Residual Dry Seasonal Flora, 26.3% to the Paranaense Flora, 5.5% to the Dry Chaco Flora, 16.7% to the Humid Chaco Flora and 29, 5% to the Flora of the *Cerrado*.

Eighty-one species of fish were found corresponding to 27 families within five orders and one class. The most abundant species was *Odontostilbe pequirá* for the seven sites (properties), followed by *Corydoras aeneus* and *Moenkhausia dichroua*. Only two species are of conservation concern, *Potamorhaphis eigenmanni* (VU) and *Odontostilbe pequirá* (LC). These findings are considered most relevant for the area and their unprecedented characteristic contributes to the knowledge of the fauna of these underexplored areas. Their association with water and ecosystem health makes these fish key elements to monitor.

Amphibians and reptiles have a fundamental role in ecosystems, as they provide a number of ecosystem services such as dispersers, biological control, nutrient recycling, and others of more anthropogenic importance such as cultural, medicinal and nutritional (Valencia-Aguilar et al., 2013).

In addition, they constitute the highest biomass compared to other vertebrates in some environments (U.S. EPA 2002). Depending on the scale at which they are studied, amphibians can be good indicators of the condition of natural systems (Heyer et al. 1994), given that they use several ecosystems during their life cycle. Consequently, their monitoring is recommended, in particular within ecosystems that are threatened or subject to activities that alter the landscape, such as its structure and the use of agrochemicals (pesticides).

Within this statement fish are also incorporated, due to their relationship with the aquatic environment as indicated. Although the dimensions and the high heterogeneity of environments of the study area have not allowed obtaining a complete resolution of the diversity of amphibians and reptiles in the area, the findings were important and suggest more studies in the field, with the addition of passive methods of captures such as fenced pit traps (Corn 1994; Willson & Gibbons 2010).

From the ornithological point of view, despite the fact that the natural communities of the Cerrado that were evaluated were altered, and several areas could not be covered due to situations unrelated to the sampling campaign (insecurity), they still harbored species with several important criteria, when considering this faunal group as a tool to monitor the changes that have occurred and which will occur in the future in the area. The significance of the riparian forests is highlighted, since they were the communities with the greatest richness and abundance of bird species, followed by the floodable savannas with isolated islets made up of woody plants and vines. These results clearly demonstrate the remarkable value of these biological corridors between the different zones, including nearby protected areas, as well as their relevance in terms of the provision of fundamental ecosystem services, such as the provision of water and soil support. The predominance of species of the Psittacidae family (parrots, parakeets and macaws), a group highly sensitive to extraction for illegal trafficking and loss of habitat, in all plant formations suggests that they serve as a refuge and source of food for the species of this family of birds.

The presence of macaws in the area has potential as an ecotourism attraction, which offers a sustainable conservation strategy, as well as an added value to the environmental commitment of the project. The presence of *Crax fasciolata* and *Pipile cumanensis* highlights the importance of forest formations since this species have few current records in Paraguay, especially in the Eastern Region. For this reason, it is essential to pay special attention to this species within these plant formations. Species such as the Greater Rhea (*Rhea americana*), NT at international level and *Seriema cristata*, are two outstanding species dependent of open natural communities such as savannas and cerrado fields, both species are easy to detect when present and could be good indicators of habitat quality given their specific habitat types. Within the less conspicuous grassland and savanna species, the *Sporophila* seedeaters are good indicators as these species are affected by changes in humid grasslands and these species develop seasonal movements because of refuges and food.

All these species are large, striking, and charismatic, qualities that strengthen the potential to be considered flagship species in the study area. The area is home to species of interest with different states of conservation at national and international level, which occur in the Cerrado, in addition to the species that use this area as a stopping point within their regional migratory routes, which makes them potentially indicator species for implement measures and strategies that make the undertaking's environmental commitment visible.

The species richness of mammals observed during this work is satisfactory taking into consideration the number of days of sampling and methodological limitations (risk of theft of camera traps, for example). Nevertheless, the fact that evidence of unidentified species was found means that additional sampling methods should be used to increase the list of species, specifically for the smaller mammal species (bats, rodents and marsupials) by employing the use of traps and acoustic methods. Furthermore, it highlights the need to increase the sampling effort in areas where species of high importance could be detected and documented, such as the jaguar, the maned wolf, the pampas deer, the giant armadillo and the bush dog, among others. The records of unidentified tracks and the record of the pantanal cat confirm how poorly studied the area is. Based on these results, the technical team expects more surprises and estimates that species richness will continue to increase as more sites are sampled or more replications are carried out.

Furthermore, the records of species of interest for conservation such as the jaguar, the maned wolf, the tapir, the giant anteater, the ocelot and the white-lipped peccary, highlight the importance of the area, and these species should be the focus of conservation and research efforts. All are charismatic species, relatively easy to monitor and have great ecological value within the fauna communities, as well as being representative species of the region.

The project could be viable and compatible with the conservation of biodiversity, considering criteria such as: avoiding the elimination / degradation of native forests, avoiding planting in springs, riparian strips, wetlands and seasonally flooded areas, maintaining biological corridors and buffer strips, restricting and controlling hunting, wildlife capture or harassment; and complemented with a program for fire prevention and biodiversity monitoring.

6. RECOMMENDATIONS

Recommendations can be grouped into six general axes (Figure 6–1). These groups could form part of a future Environmental and Social Management Plan, with key aspects that aim to safeguard the due diligence of the Parcel Project proportional to the nature and potential significance of the possible environmental and social risks and impacts.

Figure 6-1 Preliminary grouping of the recommendations resulting from the first campaign



- From the landscape and the structure of natural communities:
 - First, it is recommended as a priority to identify and maintain sites that can be ecologically functional as habitats for the occurrence of the species of interest.
- From sites with a particular natural richness:
 - Protect representative areas of all the plant formations identified within the study area, ensuring connectivity between them, considering they constitute habitats of great importance to ensure the conservation of biodiversity and the flow of populations and genetics.
 - Pay special attention to the protection of the formations of the Cerrado phytophysionomies, given their importance from the point of view of their representativeness and biodiversity. This will allow for its recovery from the degradation processes due to grazing and the periodic burning that it has suffered for many years.
 - Maintain conservation areas in Soledad and Zapallo, site of *Discocactus hartmanii* occurrence. Maintain conservation areas as biodiversity corridors and relevant areas for feeding fauna and fulfilling other functions, which especially include the high Savannas, flooded Savannas and flooded Savannas; especially those areas where they coincide with the wooded formations.
 - Preserve the islets that are structurally and floristically functional parts of the vegetation mosaic, where the floodable Savanna is the main matrix. They are critical pieces that contribute to the overall stability and connectivity
- From the intervention with plantations:
 - Take good care when working on the design of the productive landscape, bearing in mind the core areas and the connectivity of the landscape, necessary for the long-term survival of species. Also, keep in mind that the grasslands, savannas and open areas constitute fundamental ecosystems of the *Cerrado* and that many species of mammals depend on these ecosystems.

- Avoid excessive interdigitation between forested and natural environments and minimize the contact surface. Maintain sufficient distance between natural environments (forests, bodies of water of all kinds, sabanoid formations) and forest plantations. Consider that some species of fauna (birds for example) feed in nearby open environments and the viability of populations requires different habitats and natural communities.
- Biodiversity monitoring
 - Prioritize the monitoring planned for the autumn-winter (dry season) and add new complementary surveying areas where possible.
 - Prepare and carry out a permanent monitoring plan of the water conditions present in the ecosystem, for both the rainy season and the dry season.
 - Create and implement a regular and ongoing monitoring plan for the flagship species that are selected in order to know how the community of mammals is affected by the forthcoming changes in land use with the forestry project, and have the support that this monitoring can generate to strengthen the commitment to the conservation of biodiversity.
- Research
 - Seek to record the phylogenetic resources that constitute endemisms and those recorded only a single time in the country more than 100 years ago.
 - Carry out ecotoxicology studies to determine the effect of herbicides and insecticides on the genetic material and the survival of fish and amphibians.
 - Implement studies that use birds as biological indicators of environmental quality and value their ecological functions within the area, providing an unprecedented importance at a national level, specifically associated with this productive activity.
 - Create alliances with the Academia that allows for the inventory and monitoring of the rest of the biological diversity, such as the preliminary findings on fungi and invertebrates, as well as prioritizing research and providing a space for thesis work.
 - Expand research to taxa that were not properly surveyed in this work, in particular with fungi, invertebrates and other groups that could provide important information on the interrelationships between biotic and abiotic environments.
- Environmental awareness and education:
 - Design awareness programs and establish prohibitions within the boundaries of the study area, to help maintain healthy community and populations, connected adequately, and especially for those species with some degree of threat.
 - Work closely with the local communities to become familiar with their knowledge of wildlife, as well as the uses they make of it. Understanding these uses could be important, since changes in the landscape often lead to changes in animal behavior, which in turn

7. ACKNOWLEDGEMENTS

- Special thanks to Mr. Cyro Croce and the entire PARACEL team for providing us with all the logistical support within the area during this data collection campaign, as well as the staff of the Gavilán Ranch for their hospitality.
- To Cristóbal Jara for his support and valuable contributions regarding the biodiversity of Estancia Soledad.
- To Mr. Gilberto Shupp for the accompaniment and for the contribution of documented records and relevant ethological observations for the validation of sign identifications.
- To Zulma Sosa for her support during the days of fieldwork within the study area.
- To Mr. Morales for identifying the safest access points to carry out the survey within the study area.
- To Barbara De Madrignac, Yolanda Ramos, Cristhian Báez and Óscar Feltes for their teamwork efforts which was key to achieving the proposed objectives.
- To Danilo Salas for the loan of the mist nets, and Leticia López for the poles to support these nets.
- To Hugo López, from the Museo de La Plata, for his kind support in assisting with the identification of fish.
- To Michelle Campi, from the Mycology Lab of the Universidad Nacional de Asuncion, for the identification of fungi.
- To Sergio Ríos for the identification of butterflies.
- To John Kochalka, from the National Museum of Natural History of Paraguay, for the identification of spiders.
- To Hugo del Castillo, for making available the Guyra Paraguay Biodiversity Database (BDBGP) for the preparation of the lists.
- To Hugo Cabral, Doctoral Student at the Universidade Estadual Paulista, for his contribution to the herpetological records.
- To the researchers who selflessly contributed to the identification of plant species of specific botanical families: Claudia Pereira (Passifloraceae), Nelida Soria (Asteraceae), Patricia Esquivel (Apiaceae), Irene Gauto (Arecaceae), Gloria Delmás de Rojas and Juana De Egea (Campanulaceae).
- To Jeffrey Thompson, Agustín Paviolo, Enrique Bucher y Gabriel Boaglio for the confirmation in the identification of wild cats.
- To Paul Smith for confirming the identification of *Cabassous unicinctus* y *Cerradomys scotti*.
- To Alberto Esquivel, for his support in the methodological design for the ornithofauna data collection, as well as for the identification of bird vocalizations recorded in the field and processed at the office.
- To Arne Lesterhuis and Andrés Álvarez, for their help with identification of psitacids recorded during the field surveys.
- To César Benitez, César Manchini Céspedes for fish, to Sara Escobar Chávez for amphibians and reptiles, and to Ruth Ferrando López for mammals during the dry season monitoring.
- To Juan Carlos Rudolf for the review of the report and the pertinent contributions.

- To Celso Fernández and Juan Careaga, field assistants in logistics and flora.

8. LITERATURE

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ANNEX

Vegetation and Flora

List of species with common names and conservation status

N°	Taxa	Especie	Nombre Común	MADES	CITES	UIC N
				Res. 470/19	Apéndice	
PTERIDOPHYTA						
1	Anemiaceae	<i>Anemia</i> sp.				
2	Aspleniaceae	<i>Asplenium clausenii</i> Hieron.				
3	Lygodiaceae	<i>Lygodium venustum</i> Sw.				
4	Lygodiaceae	<i>Lygodium volubile</i> Sw.	yvyra rague			
5	Marsileaceae	<i>Marsilea anciclopoda</i> A.Braun				
6	Polypodiaceae	<i>Microgramma persicariifolia</i> (Schrad.) C. Presl	anguja ruguai			
7	Polypodiaceae	<i>Microgramma vacciniifolia</i> (Langsd. & Fisch.) Copel.	anguja ruguai			
8	Polypodiaceae	<i>Phlebodium decumanum</i> (Willd.) J. Sm.	kalaguala			
9	Polypodiaceae	<i>Pleopeltis minima</i> (Bory) J. Prado & R.Y. Hirai				
10	Polypodiaceae	<i>Polypodium</i> sp.				
11	Psilotaceae	<i>Psilotum nudum</i> (L.) P. Beauv.				
12	Pteridaceae	<i>Adiantopsis radiata</i> (L.) Fée	helecho sombrilla			
13	Pteridaceae	<i>Adiantum latifolium</i> Lam.				
14	Pteridaceae	<i>Adiantum serrato-dentatum</i> Humb. & Bonpl. ex Willd.				
15	Pteridaceae	<i>Doryopteris pentagona</i> Pic. Serm.				
16	Pteridaceae	<i>Doryopteris</i> sp.				
17	Pteridaceae	<i>Hemionitis tomentosa</i> (Lam.) Raddi	doradilla	EN		
18	Pteridaceae	<i>Pteris denticulata</i> Sw. var. <i>denticulata</i>				
19	Selaginellaceae	<i>Selaginella sellowii</i> Hieron.	Pasto del monte			
20	Selaginellaceae	<i>Selaginella</i> sp.				
21	Pteridophyta	Morfoespecie 1				
22	Pteridophyta	Morfoespecie 2				

N°	Taxa	Especie	Nombre Común	MADE	CITES	UIC N
				Res. 470/19	Apéndice	
MONOCOTYLEDONAE						
23	Alismataceae	<i>Echinodorus grandiflorus</i> (Cham. & Schltld.) Micheli	cucharero			
24	Alismataceae	<i>Echinodorus</i> sp.				
25	Alismataceae	<i>Hydrocleys nymphoides</i> (Willd.) Buchenau				
26	Alismataceae	<i>Limnocharis flava</i> (L.) Buchenau				
27	Alismataceae	<i>Limnocharis laforestii</i> Griseb.				
28	Amaryllidaceae	cfr. <i>Hippeastrum</i> sp.	lirio			
29	Amaryllidaceae	<i>Nothoscordum</i> sp.				
30	Araceae	<i>Lemna minuta</i> Kunth				
31	Araceae	<i>Thaumatococcus undulatum</i> (Engl.) Sakur., Calazans & Mayo	guembe			
32	Arecaceae	<i>Acrocomia aculeata</i> (Jacq.) Lodd. ex Mart.	mbokaja			
33	Arecaceae	<i>Acrocomia hassleri</i> (Barb. Rodr.) W.J. Hahn	mbokaja'i	AE		
34	Arecaceae	<i>Allagoptera</i> sp.				
35	Arecaceae	<i>Attalea phalerata</i> Mart. ex Spreng.	guacuri			
36	Arecaceae	<i>Bactris glaucescens</i> Drude	karanda	EN		LC
37	Arecaceae	<i>Butia paraguayensis</i> (Barb. Rodr.) L.H. Bailey	jata'i			
38	Arecaceae	<i>Butia</i> sp.				
39	Arecaceae	<i>Copernicia alba</i> Morong	karanda'y			
40	Arecaceae	<i>Syagrus campylospatha</i> (Barb. Rodr.) Becc.	jata'i mi	AE		
41	Arecaceae	<i>Syagrus oleracea</i> (Mart.) Becc.	guaviroba	EN		
42	Arecaceae	<i>Syagrus romanzoffiana</i> (Cham.) Glassman	pindo			
43	Bromeliaceae	<i>Bromelia balansae</i> Mez	karaguata			
44	Bromeliaceae	<i>Bromelia serra</i> Griseb.	karaguata			
45	Bromeliaceae	<i>Pseudananas sagenarius</i> (Arruda) Camargo	yvira			
46	Bromeliaceae	<i>Tillandsia loliacea</i> Mart. ex Schult. f.	clavel del aire			
47	Bromeliaceae	<i>Tillandsia recurvifolia</i> Hook.	clavel del aire			
48	Commelinaceae	<i>Commelina diffusa</i> Burm. f.				

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N°	Taxa	Especie	Nombre Común	MADES	CITES	UICN
				Res. 470/19	Apéndice	
49	Commelinaceae	<i>Commelina erecta</i> L.	Santa Lucía hovy			
50	Commelinaceae	<i>Tradescantia</i> sp.				
51	Cyperaceae	<i>Abildgaardia ovata</i> (Burm.f.) Kral				
52	Cyperaceae	<i>Bulbostylis sphaerocephala</i> (Boeck.) Lindm.				
53	Cyperaceae	<i>Bulbostylis</i> sp.				
54	Cyperaceae	<i>Cyperus giganteus</i> Vahl.	piri guasu			
55	Cyperaceae	<i>Cyperus sesquiflorus</i> (Torr.) Mattf. & Kük ex Kük				
56	Cyperaceae	<i>Cyperus surinamensis</i> Rottb.				
57	Cyperaceae	<i>Cyperus</i> sp.1				
58	Cyperaceae	<i>Cyperus</i> sp.2				
59	Cyperaceae	<i>Cyperus</i> sp.3				
60	Cyperaceae	<i>Cyperus</i> sp.4				
61	Cyperaceae	<i>Cyperus</i> sp.5				
62	Cyperaceae	<i>Cyperus</i> sp.6				
63	Cyperaceae	<i>Eleocharis elegans</i> (Kunth) Roem. & Schult.				
64	Cyperaceae	<i>Eleocharis</i> aff. <i>plicarhachis</i> (Griseb.) Svenson				
65	Cyperaceae	<i>Eleocharis</i> sp.1				
66	Cyperaceae	<i>Eleocharis</i> sp.2				
67	Cyperaceae	<i>Fymbristylis</i> sp.1				
68	Cyperaceae	<i>Fymbristylis</i> sp.2				
69	Cyperaceae	<i>Rhynchospora albiceps</i> Kunth				
70	Cyperaceae	<i>Rhynchospora nervosa</i> (Vahl.) Boeck.				
71	Cyperaceae	<i>Rhynchospora setigera</i> (Kunth) Boeck.				
72	Cyperaceae	<i>Rhynchospora</i> sp.1				
73	Cyperaceae	<i>Rhynchospora</i> sp.2				
74	Cyperaceae	<i>Rhynchospora</i> sp.3				
75	Cyperaceae	<i>Rhynchospora</i> sp.4				
76	Cyperaceae	<i>Rhynchospora</i> sp.5				
77	Cyperaceae	<i>Rhynchospora</i> sp.6				
78	Cyperaceae	<i>Scleria distans</i> Poir.				LC
79	Cyperaceae	<i>Scleria</i> sp.1				
80	Cyperaceae	<i>Scleria</i> sp.2				

N°	Taxa	Especie	Nombre Común	MADE S	CITES	UIC N
				Res. 470/19	Apéndice	
81	Cyperaceae	Morfoespecie 1				
82	Cyperaceae	Morfoespecie 2				
83	Cyperaceae	Morfoespecie 3				
84	Cyperaceae	Morfoespecie 4				
85	Cyperaceae	Morfoespecie 5				
86	Cyperaceae	Morfoespecie 6				
87	Cyperaceae	Morfoespecie 7				
88	Cyperaceae	Morfoespecie 8				
89	Cyperaceae	Morfoespecie 9				
90	Cyperaceae	Morfoespecie 10				
91	Cyperaceae	Morfoespecie 11				
92	Heliconiaceae	<i>Heliconia</i> aff. <i>hirsuta</i> L.f.				
93	Iridaceae	<i>Cipura paludosa</i> Aubl. ssp. <i>boliviensis</i> Ravenna				
94	Iridaceae	<i>Sisyrinchium weirii</i> Baker	Capim-trança			
95	Iridaceae	<i>Sisyrinchium</i> sp.1				
96	Iridaceae	<i>Sisyrinchium</i> sp.2				
97	Mayacaceae	<i>Mayaca sellowiana</i> Kunth				
98	Orchidaceae	<i>Bulbophyllum</i> sp.	orquídea			
99	Orchidaceae	<i>Campylocentrum</i> cfr. <i>neglectum</i> (Rchb. f. & Warm.) Cogn.	orquídea			
100	Orchidaceae	<i>Habenaria amambayensis</i> Schltr.	orquídea		II	
101	Orchidaceae	<i>Oeceoclades maculata</i> (Lindl.) Lindl.	orquídea burrito		II	LC
102	Orchidaceae	<i>Trichocentrum cebolleta</i> (Jacq.) M.W. Chase & N.H. Williams	orquídea		II	
103	Orchidaceae	<i>Trichocentrum morenoi</i> (Dodson & Luer) M.W. Chase & N.H. Williams	orquídea			
104	Orchidaceae	Morfoespecie	orquídea			
105	Poaceae	<i>Andropogon bicornis</i> L.	aguara ruguái			
106	Poaceae	<i>Andropogon lateralis</i> Nees	Kapi'i pyta			
107	Poaceae	<i>Andropogon selloanus</i> (Hack.) Hack.				
108	Poaceae	<i>Andropogon</i> sp.1				
109	Poaceae	<i>Andropogon</i> sp.2				

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N°	Taxa	Especie	Nombre Común	MADES	CITES	UIC N
				Res. 470/19	Apéndice	
110	Poaceae	<i>Aristida</i> sp.1	pasto rulito			
111	Poaceae	<i>Aristida</i> sp.2				
112	Poaceae	<i>Axonopus</i> sp.				
113	Poaceae	<i>Elionurus muticus</i> (Spreng.) Kuntze	espartillo			
114	Poaceae	<i>Eustachys</i> aff. <i>distichophylla</i> (Lag.) Nees	capim- branco			
115	Poaceae	<i>Gouinia brasiliensis</i> (S. Moore) Swallen				
116	Poaceae	<i>Guadua chacoensis</i> (Rojas) Londoño & P.M. Peterson	takuara			
117	Poaceae	<i>Hymenachne amplexicaulis</i> (Rudge) Nees	camalotillo			
118	Poaceae	cfr. <i>Hymenachne</i> sp.				
119	Poaceae	<i>Hyparrhenia rufa</i> (Nees) Stapf	Jaragua			
120	Poaceae	<i>Imperata brasiliensis</i> Trin.	jahape			
121	Poaceae	<i>Lasiacis sorghoidea</i> (Desv. ex Ham.) Hitchc. & Chase				
122	Poaceae	<i>Lasiacis</i> sp.				
123	Poaceae	<i>Merostachys clausenii</i> Munro	takuapi			
124	Poaceae	<i>Ocellochloa stolonifera</i> (Poir.) Zuloaga & Morrone				
125	Poaceae	<i>Oedochloa procurrens</i> (Nees ex Trin.) C. Silva & R.P. Oliveira				
126	Poaceae	cfr. <i>Pappophorum</i> sp.				
127	Poaceae	<i>Paspalum</i> aff. <i>intermedium</i> Munro ex Morong & Britton				
128	Poaceae	<i>Paspalum</i> sp.1				
129	Poaceae	<i>Paspalum</i> sp.2				
130	Poaceae	<i>Paspalum</i> sp.3				
131	Poaceae	<i>Paspalum</i> sp.4				
132	Poaceae	<i>Paspalum</i> sp.5				
133	Poaceae	<i>Paspalum</i> sp. 6				
134	Poaceae	<i>Pharus lappulaceus</i> Aubl.				
135	Poaceae	<i>Schizachyrium</i> sp.1	aguara ruguai			
136	Poaceae	<i>Schizachyrium</i> sp.2				
137	Poaceae	<i>Setaria</i> sp.1				
138	Poaceae	<i>Setaria</i> sp.2				

N°	Taxa	Especie	Nombre Común	MADE	CITES	UIC N
				S	Apéndice	
				Res. 470/19		
139	Poaceae	<i>Setaria</i> sp.3				
140	Poaceae	<i>Urochloa brizantha</i> (Hochst. ex A. Rich.) R.D. Webster				
141	Poaceae	<i>Urochloa humidicola</i> (Rendle) Morrone & Zuloaga				
142	Poaceae	Morfoespecie 1				
143	Poaceae	Morfoespecie 2				
144	Poaceae	Morfoespecie 3				
145	Poaceae	Morfoespecie 4				
146	Poaceae	Morfoespecie 5				
147	Poaceae	Morfoespecie 6				
148	Poaceae	Morfoespecie 7				
149	Poaceae	Morfoespecie 8				
150	Poaceae	Morfoespecie 9				
151	Poaceae	Morfoespecie 10				
152	Poaceae	Morfoespecie 11				
153	Poaceae	Morfoespecie 12				
154	Poaceae	Morfoespecie 13				
155	Pontederiaceae	<i>Pontederia azurea</i> Sw.	aguape puru'a			
156	Pontederiaceae	<i>Pontederia cordata</i> L. var. <i>cordata</i>	camalote			
157	Pontederiaceae	<i>Pontederia</i> aff. <i>subovata</i> (Seub.) Lowden				
158	Smilacaceae	<i>Smilax campestris</i> Griseb.				
159	Smilacaceae	<i>Smilax fluminensis</i> Steud.				
160	Smilacaceae	<i>Smilax goyazana</i> A. DC.				
161	Xyridaceae	<i>Xyris jupicai</i> Rich.				
DICOTYLEDONAE						
162	Acanthaceae	<i>Dychoriste lavandulacea</i> (Nees) Kuntze				
163	Acanthaceae	<i>Justicia brasiliana</i> Roth				
164	Acanthaceae	<i>Justicia laevilinguis</i> (Nees) Lindau				
165	Acanthaceae	<i>Ruellia angustiflora</i> (Nees) Lindau ex Rambo	mainumby ka'aguyjy			
166	Acanthaceae	<i>Ruellia multifolia</i> (Nees) Lindau var. <i>viscosissima</i> Nees) C. Ezcurra				
167	Acanthaceae	<i>Ruellia</i> aff. <i>tweediana</i> Griseb.				
168	Acanthaceae	<i>Ruellia</i> sp.1				

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N°	Taxa	Especie	Nombre Común	MADES	CITES	UIC N
				Res. 470/19	Apéndice	
169	Acanthaceae	<i>Ruellia</i> sp.2				
170	Amaranthaceae	<i>Froelichia procera</i> (Seub.) Pedersen	mil poha			
171	Amaranthaceae	<i>Gomphrena celosioides</i> Mart.	peludilla			
172	Amaranthaceae	<i>Gomphrena celosioides</i> Mart. var. <i>hygrophila</i> (Mart.) Pedersen	peludilla			
173	Amaranthaceae	<i>Pfaffia tuberosa</i> (Spreng.) Hicken				
174	Amaranthaceae	<i>Pfaffia</i> sp.1				
175	Anacardiaceae	<i>Anacardium humile</i> A. St.-Hil.	kaju'i			
176	Anacardiaceae	<i>Astronium fraxinifolium</i> Schott var. <i>glabrum</i> Engl.	urunde'y para morotĩ			
177	Anacardiaceae	<i>Astronium</i> sp.				
178	Anacardiaceae	<i>Myracrodruon urundeuva</i> Allemão	urunde'y mi			
179	Anacardiaceae	<i>Schinus weinmannifolius</i> Engl.	molle'i			
180	Anacardiaceae	<i>Tapirira guianensis</i> Aubl.	ka'ambota			
181	Annonaceae	<i>Annona dioica</i> A. St.-Hil.	aratiku ñu			LC
182	Annonaceae	<i>Annona emarginata</i> (Schltdl.) H. Rainer	aratiku'i			
183	Annonaceae	<i>Annona neosalicifolia</i> H. Rainer	aratiku'i			LC
184	Annonaceae	<i>Annona nutans</i> (R.E. Fr.) R.E. Fr.	aratiku ñu			LC
185	Annonaceae	<i>Duguetia furfuracea</i> (A. St.-Hil.) Benth. & Hook. f.	aratiku hata			LC
186	Annonaceae	<i>Xylopia aromatica</i> (Lam.) C. Mart.				LC
187	Apiaceae	<i>Eryngium ebracteatum</i> Lam.				
188	Apiaceae	<i>Eryngium sanguisorba</i> Cham. & Schltdl.				
189	Apocynaceae	<i>Aspidosperma australe</i> Müll. Arg.	kirandy			
190	Apocynaceae	<i>Aspidosperma cylindrocarpon</i> Müll. Arg.	palo rosa			LC
191	Apocynaceae	<i>Aspidosperma pyriformium</i> C. Mart.	palo rosa			LC
192	Apocynaceae	<i>Aspidosperma quebracho-blanco</i> Schltdl.	quebracho blanco			

N°	Taxa	Especie	Nombre Común	MADE	CITES	UIC N
				Res. 470/19	Apéndice	
193	Apocynaceae	<i>Aspidosperma quirandy</i> Hassl. var. <i>quirandy</i>	kirandy			
194	Apocynaceae	<i>Aspidosperma tomentosum</i> C. Mart.	kirandy del cerrado			LC
195	Apocynaceae	<i>Forsteronia glabrescens</i> Müll. Arg.	ysypo kamby			
196	Apocynaceae	<i>Forsteronia pubescens</i> A.DC.				
197	Apocynaceae	<i>Mandevilla petraea</i> (A. St.-Hil.) Pichon				
198	Apocynaceae	<i>Mandevilla</i> aff. <i>pohlana</i> (Stadelm.) A.H. Gentry				
199	Apocynaceae	<i>Mandevilla undulata</i> (C. Ezcurra) A.O. Simões, Kin.-Gouv. & M.E. Endress				
200	Apocynaceae	<i>Oxypetalum</i> sp.				
201	Apocynaceae	<i>Prestonia coalita</i> (Vell.) Woodson				
202	Apocynaceae	<i>Prestonia tomentosa</i> R. Br.				
203	Apocynaceae	<i>Rhabdadenia ragonesei</i> Woodson				
204	Apocynaceae	<i>Schubertia grandiflora</i> Mart.	paraguayita			
205	Apocynaceae	<i>Tabernaemontana catharinensis</i> A. DC.	sapirangy			LC
206	Apocynaceae	Morfoespecie 1				
207	Apocynaceae	Morfoespecie 2				
208	Araliaceae	<i>Didymopanax morototoni</i> (Aubl.) Decne. & Planch.	amba'y guasu			LC
209	Aristolochiaceae	<i>Aristolochia esperanzae</i> Kuntze	patito, ypemi			
210	Aristolochiaceae	<i>Aristolochia gibertii</i> Hook.	patito, ypemi			
211	Asteraceae	<i>Aspilia montevidensis</i> (Spreng.) Kuntze				
212	Asteraceae	<i>Aspilia</i> sp.1				
213	Asteraceae	<i>Aspilia</i> sp.2				
214	Asteraceae	<i>Bidens chodatii</i> Hassl.				
215	Asteraceae	<i>Bidens gardneri</i> Baker				
216	Asteraceae	<i>Bidens pilosa</i> L.	kapiuna			
217	Asteraceae	<i>Calea triantha</i> (Vell.) Pruski				

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218	Asteraceae	<i>Campuloclinium macrocephalum</i> (Less.) DC.				
219	Asteraceae	<i>Chaptalia</i> sp.				
220	Asteraceae	<i>Chrysolaena cognata</i> (Less.) Dematteis	jagua rayi			
221	Asteraceae	<i>Chromolaena orbignyana</i> (Klatt) R.M. King & H. Rob.				
222	Asteraceae	<i>Dasyphyllum brasiliense</i> (Spreng.) Cabrera var. <i>brasiliense</i>				
223	Asteraceae	<i>Dasyphyllum</i> sp.				
224	Asteraceae	<i>Elephantopus mollis</i> Kunth				
225	Asteraceae	<i>Elephantopus</i> aff. <i>palustris</i> Gardner				
226	Asteraceae	<i>Eupatorium variegatum</i> Malme				
227	Asteraceae	<i>Eupatorium</i> sp.1				
228	Asteraceae	<i>Eupatorium</i> sp.2				
229	Asteraceae	<i>Eupatorium</i> sp. 3				
230	Asteraceae	<i>Gymnocoronis spilantoides</i> (D. Don ex Hook. & Arn.) DC.				
231	Asteraceae	<i>Lepidaploa remotiflora</i> (Rich.) H. Rob.				
232	Asteraceae	<i>Lessingianthus niederleinii</i> (Hieron.) H. Rob.				
233	Asteraceae	<i>Lessingianthus rubricaulis</i> (Bonpl.) H. Rob.				
234	Asteraceae	<i>Mikania cynanchifolia</i> Hook. & Arn. ex B.L. Rob.				
235	Asteraceae	<i>Moquiniastrum</i> sp.				
236	Asteraceae	<i>Orthopappus angustifolius</i> (Sw.) Gleason				
237	Asteraceae	<i>Pluchea sagittalis</i> (Lam.) Cabrera	yerba de lucero			
238	Asteraceae	<i>Porophyllum ruderale</i> (Jacq.) Cass.	yryvu retyma			
239	Asteraceae	<i>Praxelis ostenii</i> (B.L. Rob.) R.M. King & H. Rob.	Ka'a poty roby			
240	Asteraceae	<i>Pterocaulon alopecuroides</i> (Lam.) DC.				
241	Asteraceae	<i>Pterocaulon lanatum</i> Kuntze				

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				Res. 470/19	Apéndice	
242	Asteraceae	<i>Pterocaulon rugosum</i> (Vahl) Malme				
243	Asteraceae	<i>Solidago chilensis</i> Meyen	mbu'y sa'yju			
244	Asteraceae	<i>Synedrellopsis grisebachii</i> Hieron. & Kuntze ex Kuntze				
245	Asteraceae	<i>Tridax paraguayensis</i> Kuntze				
246	Asteraceae	<i>Trixis</i> sp.				
247	Asteraceae	<i>Vernonanthura brasiliana</i> (L.) H. Rob.				
248	Asteraceae	<i>Vernonanthura chamaedrys</i> (Less.) H. Rob.	typycha morotĩ			
249	Asteraceae	<i>Vernonia</i> sp.2				
250	Asteraceae	cfr. <i>Vernonia</i> sp.				
251	Asteraceae	Morfoespecie 1				
252	Asteraceae	Morfoespecie 2				
253	Balanophoraceae	<i>Lophophytum mirabile</i> Schott & Endl.	yvoty yvy			
254	Bignoniaceae	<i>Amphilophium paniculatum</i> (L.) Kunth				
255	Bignoniaceae	<i>Handroanthus heptaphyllus</i> (Vell.) Mattos	tajy hü	EN		LC
256	Bignoniaceae	<i>Handroanthus impetiginosus</i> (Mart. ex DC.) Mattos	lapacho rosado			LC
257	Bignoniaceae	<i>Handroanthus ochraceus</i> (Cham.) Mattos ssp. <i>ochraceus</i>	tajy sa'y ju	AE		
258	Bignoniaceae	<i>Handroanthus pulcherrimus</i> (Sandwith) S. Grose	tajy sa'yju	AE		
259	Bignoniaceae	<i>Jacaranda mimosifolia</i> D. Don	jakaranda			
260	Bignoniaceae	<i>Sparattosperma leucanthum</i> (Vell.) K. Schum.	caroba blanca (BR)			
261	Bignoniaceae	<i>Tabebuia aurea</i> (Silva Manso) Benth. & Hook. f. ex S. Moore	paratodo			
262	Bignoniaceae	<i>Tabebuia roseo-alba</i> (Ridl.) Sandwith	lapacho blanco			
263	Bignoniaceae	<i>Tanaecium dichotomum</i> (Jacq.) Kaeher & L.G. Lohmann				
264	Boraginaceae	<i>Cordia americana</i> (L.) Gottschling & J.S. Mill.	guajayvi			

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				Res. 470/19	Apéndice	
265	Boraginaceae	<i>Cordia glabrata</i> A. DC.	peterevy morotĩ			
266	Boraginaceae	<i>Cordia trichotoma</i> (Vell.) Arráb. ex Steud.	peterevy hü	EN		LC
267	Boraginaceae	<i>Euploca filiformis</i> (Lehm.) J.I. M. Melo & Semir				
268	Boraginaceae	<i>Varronia</i> sp.				
269	Burseraceae	<i>Protium heptaphyllum</i> (Aubl.) Marchand	yvyra ysy			LC
270	Cactaceae	<i>Cereus stenogonus</i> K. Schum.	tuna		II	LC
271	Cactaceae	<i>Discocactus hartmanii</i> (K. Schum.) Britton & Rose		EN	II	CR
272	Cactaceae	<i>Monvillea cavendishii</i> (Monv.) Britton & Rose	tuna		II	
273	Cactaceae	<i>Opuntia elata</i> Link & Otto ex Salm-Dyck var. <i>cardiosperma</i> (K. Schum) R. Kiesling	tuna		II	LC
274	Cactaceae	<i>Rhipsalis</i> sp.	suelta con suelta			
275	Campanulaceae	<i>Lobelia</i> aff. <i>nummularioides</i> Cham.				
276	Cannabaceae	<i>Celtis brasiliensis</i> (Gardner) Planch.	Juasy'y			
277	Cannabaceae	<i>Celtis iguanaea</i> (Jacq.) Sarg.	juasy'y			LC
278	Cannabaceae	<i>Celtis</i> sp.1	juasy'y			
279	Cannabaceae	<i>Celtis</i> sp.2	juasy'y			
280	Cannabaceae	<i>Trema micrantha</i> (L.) Blume	kurundi'y			
281	Celastraceae	<i>Hippocratea volubilis</i> L.				
282	Celastraceae	<i>Monteverdia ilicifolia</i> (Mart. ex Reissek) Biral	kangorosa	EN		
283	Celastraceae	<i>Plenckia populnea</i> Reissek				
284	Celastraceae	<i>Salacia elliptica</i> (Mart. ex Schult.) G. Don	pakuri guasu			LC
285	Celastraceae	<i>Semialarium paniculatum</i> (Mart. ex Schult.) N. Hallé				
286	Celastraceae	<i>Tontelea micrantha</i> (Mart. ex Schult.) A.C. Sm.				
287	Clusiaceae	<i>Garcinia brasiliensis</i> Mart.	pakuri			
288	Combretaceae	<i>Combretum leprosum</i> Mart.	carne de vaca			

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289	Combretaceae	<i>Combretum</i> sp.				
290	Combretaceae	<i>Terminalia argentea</i> Mart.	capitán			LC
291	Combretaceae	<i>Terminalia triflora</i> (Griseb.) Lillo	guajayvi sa'yju			LC
292	Convolvulaceae	<i>Bonamia</i> aff. <i>subsessilis</i> Hassl.				
293	Convolvulaceae	<i>Cuscuta</i> sp.	cabello de ángel			
294	Convolvulaceae	<i>Evolvulus sericeus</i> Sw. var. <i>sericeus</i>				
295	Convolvulaceae	<i>Evolvulus</i> sp.				
296	Convolvulaceae	<i>Ipomoea</i> aff. <i>aemilii</i> (O'Donell) J.R. I. Wood & R. Degen ENDEMICA				
297	Convolvulaceae	<i>Ipomoea malveoides</i> Meisn.				
298	Convolvulaceae	<i>Ipomoea</i> sp.1				
299	Convolvulaceae	<i>Ipomoea paludicola</i> J.R.I. Wood & R.W. Scotland				
300	Convolvulaceae	<i>Jacquemontia fruticulosa</i> Hallier f.				
301	Cucurbitaceae	<i>Melothria pendula</i> L.				
302	Cucurbitaceae	<i>Siolmatra brasiliensis</i> (Cogn.) Baill.				
303	Dilleniaceae	<i>Curatella americana</i> L.				
304	Ebenaceae	<i>Diospyros lasiocalyx</i> (Mart.) B. Walln.				
305	Erythroxylaceae	<i>Erythroxylum cuneifolium</i> (Mart.) O.E. Schulz	coca del monte			
306	Erythroxylaceae	<i>Erythroxylum suberosum</i> A. St.-Hil.				LC
307	Euphorbiaceae	<i>Acalypha variabilis</i> Klotzsch ex Baill.				
308	Euphorbiaceae	<i>Acalypha</i> sp.1				
309	Euphorbiaceae	<i>Acalypha</i> sp.2				
310	Euphorbiaceae	<i>Actinostemon concepcionis</i> (Chodat & Hassl.) Hochr.				
311	Euphorbiaceae	<i>Adelia membranifolia</i> (Müll. Arg.) Chodat & Hassl.				
312	Euphorbiaceae	<i>Bernardia polymorpha</i> Chodat & Hassl.				

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313	Euphorbiaceae	<i>Caperonia aff. castaneifolia</i> (L.) A. St.-Hil.				
314	Euphorbiaceae	<i>Caperonia aff. palustris</i> (L.) A.St.-Hill.				
315	Euphorbiaceae	<i>Cnidoscolus albomaculatus</i> (Pax) I.M. Johnst.				
316	Euphorbiaceae	<i>Croton andinus</i> Müll. Arg.				
317	Euphorbiaceae	<i>Croton apostolon</i> Radcl.-Sm. & Govaerts				
318	Euphorbiaceae	<i>Croton campestris</i> A. St.- Hil.				
319	Euphorbiaceae	<i>Croton glandulosus</i> L.				
320	Euphorbiaceae	<i>Croton rupestris</i> (Chodat & Hassl.) G.L. Webster				
321	Euphorbiaceae	<i>Croton trinitatis</i> Millsp.				
322	Euphorbiaceae	<i>Croton urucurana</i> Baill.	sangre de drago			
323	Euphorbiaceae	<i>Croton</i> sp.1				
324	Euphorbiaceae	<i>Croton</i> sp.2				
325	Euphorbiaceae	<i>Croton</i> sp.3				
326	Euphorbiaceae	<i>Croton</i> sp.4				
327	Euphorbiaceae	<i>Croton</i> sp.5				
328	Euphorbiaceae	<i>Dalechampia scandens</i> L.				
329	Euphorbiaceae	<i>Dalechampia</i> sp.				
330	Euphorbiaceae	<i>Gymnanthes discolor</i> (Spreng.) Müll. Arg.				
331	Euphorbiaceae	<i>Jatropha elliptica</i> (Pohl) Oken				
332	Euphorbiaceae	<i>Manihot aff. anisophylla</i> Müll. Arg.				
333	Euphorbiaceae	<i>Manihot</i> sp.1				
334	Euphorbiaceae	<i>Manihot</i> sp.2				
335	Euphorbiaceae	<i>Microstachys hispida</i> (Mart.) Govaerts				
336	Euphorbiaceae	<i>Philyra brasiliensis</i> Klotzsch				
337	Euphorbiaceae	<i>Sapium haemospermum</i> Müll. Arg.	kurupika'y			LC
338	Euphorbiaceae	<i>Sebastiania</i> sp.1				
339	Euphorbiaceae	<i>Sebastiania</i> sp.2				
340	Euphorbiaceae	<i>Sebastiania</i> sp.3				
341	Euphorbiaceae	<i>Stillingia aff. salpingadenia</i> (Muell. Arg.) Huber				

N°	Taxa	Especie	Nombre Común	MADE S	CITES	UIC N
				Res. 470/19	Apéndice	
342	Fabaceae	<i>Acosmium subelegans</i> (Mohlenbr.) Yakovlev				
343	Fabaceae	<i>Adesmia</i> sp.				
344	Fabaceae	<i>Aeschynomene</i> aff. <i>americana</i> L.				
345	Fabaceae	<i>Aeschynomene elegans</i> Schltld. & Cham.				
346	Fabaceae	<i>Aeschynomene histrix</i> Poir.				
347	Fabaceae	<i>Aeschynomene</i> sp. 1				
348	Fabaceae	<i>Aeschynomene</i> sp.2				
349	Fabaceae	<i>Albizia niopoides</i> (Spruce ex Benth.) Burkart	yvyra ju			LC
350	Fabaceae	<i>Amburana cearensis</i> (Allemão) A.C. Sm.	trébol	EN		EN
351	Fabaceae	<i>Anadenanthera colubrina</i> (Vell.) Brenan var. <i>cebil</i> (Griseb.) Altschul	kurupa'y kuru			LC
352	Fabaceae	<i>Anadenanthera peregrina</i> (L.) Speg.	morosyvo			
353	Fabaceae	<i>Andira humilis</i> Mart. ex Benth.				
354	Fabaceae	<i>Arachis diogoi</i> Hoehne				NT
355	Fabaceae	<i>Arachis hassleri</i> Krapov., Valls & C.E. Simpson				
356	Fabaceae	<i>Arachis nitida</i> Valls, Krapov. & C.E. Simpson				
357	Fabaceae	<i>Arachis paraguariensis</i> Chodat & Hassl. ssp. <i>paraguariensis</i>				NT
358	Fabaceae	<i>Arachis pflugeae</i> C.E. Simpson, Krapov. & Valls				
359	Fabaceae	<i>Arachis</i> sp.1				
360	Fabaceae	<i>Arachis</i> sp.2				
361	Fabaceae	<i>Bauhinia cheilantha</i> (Bong.) Steud.				LC
362	Fabaceae	<i>Bauhinia forficata</i> Link ssp. <i>pruinosa</i> (Vogel) Fortunato & Wunderlin	pata de buey			
363	Fabaceae	<i>Bauhinia hagenbeckii</i> Harms				
364	Fabaceae	<i>Bauhinia</i> cfr. <i>mollis</i> (Bong.) D. Dietr.				
365	Fabaceae	<i>Bauhinia</i> sp.1				
366	Fabaceae	<i>Bauhinia</i> sp.2				

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367	Fabaceae	<i>Bauhinia</i> sp.3				
368	Fabaceae	<i>Calliandra brevicaulis</i> Micheli var. <i>brevicaulis</i>				
369	Fabaceae	<i>Calliandra parviflora</i> Hook. & Arn.	niño azote			
370	Fabaceae	<i>Camptosema</i> sp.				
371	Fabaceae	<i>Cenostigma marginatum</i> (Tul.) E. Gagnon & G.P. Lewis				
372	Fabaceae	<i>Chamaecrista flexuosa</i> (L.) Green				
373	Fabaceae	<i>Chamaecrista rotundifolia</i> (Pers.) Greene				
374	Fabaceae	<i>Chamaecrista serpens</i> (L.) Greene				
375	Fabaceae	<i>Chamaecrista</i> aff. <i>nictitans</i> (L.) Moench				
376	Fabaceae	<i>Chamaecrista calycioides</i> (DC. ex Collad.) Greene	fedegoso			
377	Fabaceae	<i>Chloroleucon tenuiflorum</i> (Benth.) Barneby & J.W. Grimes	tatare			
378	Fabaceae	<i>Copaifera langsdorffii</i> Desf.	kupa'y			LC
379	Fabaceae	<i>Crotalaria maypurensis</i> Kunth				
380	Fabaceae	<i>Crotalaria</i> sp.1				
381	Fabaceae	<i>Cyclolobium brasiliense</i> Benth.				LC
382	Fabaceae	<i>Desmanthus</i> sp.				
383	Fabaceae	<i>Desmodium barbatum</i> (L.) Benth.	taha taha			LC
384	Fabaceae	<i>Desmodium incanum</i> DC.	taha taha			
385	Fabaceae	<i>Desmodium</i> sp.2	taha taha			
386	Fabaceae	<i>Desmodium</i> sp.3	taha taha			
387	Fabaceae	<i>Dimorphandra mollis</i> Benth.	lorito pysä	EN		LC
388	Fabaceae	<i>Dipteryx alata</i> Vogel				
389	Fabaceae	<i>Enterolobium contortisiliquum</i> (Vell.) Morong	timbo			LC
390	Fabaceae	<i>Enterolobium timbouva</i> Mart.	timbo			LC
391	Fabaceae	<i>Eriosema longifolium</i> Benth.	fejão-bravo			
392	Fabaceae	<i>Guibourtia hymenaeifolia</i> (Moric.) J. Léonard	kuruñai			
393	Fabaceae	<i>Holocalyx balansae</i> Micheli	yvyra			LC

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				Res. 470/19	Apéndice	
			pepe			
394	Fabaceae	<i>Hymenaea martiana</i> Hayne	jata'yva			
395	Fabaceae	<i>Hymenaea</i> sp.1				
396	Fabaceae	<i>Indigofera suffruticosa</i> Mill.				
397	Fabaceae	<i>Indigofera asperifolia</i> Bong. ex Benth.				
398	Fabaceae	<i>Inga affinis</i> DC.	inga			
399	Fabaceae	<i>Inga uraguensis</i> Hook. & Arn.	inga guasu			
400	Fabaceae	<i>Inga</i> sp.				
401	Fabaceae	<i>Lonchocarpus pluviialis</i> Rusby				
402	Fabaceae	<i>Machaerium aculeatum</i> Raddi	yvyra tanimbu			
403	Fabaceae	<i>Machaerium acutifolium</i> Vogel				LC
404	Fabaceae	<i>Machaerium hirtum</i> (Vell.) Stellfeld				
405	Fabaceae	<i>Macroptilium</i> sp.				
406	Fabaceae	<i>Mimosa debilis</i> Humb. & Bonpl. ex Willd.	jukeri			
407	Fabaceae	<i>Mimosa dolens</i> Vell.				
408	Fabaceae	<i>Mimosa glutinosa</i> Chodat & Hassl.				
409	Fabaceae	<i>Mimosa pudica</i> L.				
410	Fabaceae	<i>Mimosa subsericea</i> Benth.				
411	Fabaceae	<i>Mimosa xanthocentra</i> Mart. var. <i>xanthocentra</i>				
412	Fabaceae	<i>Mimosa gracilis</i> Benth. ssp. <i>capillipes</i> (Benth.) Barneby				
413	Fabaceae	<i>Mimosa somnians</i> Humb. & Bonpl. ex Willd. ssp. <i>lasiocarpa</i> (Benth.) Barneby				
414	Fabaceae	<i>Mimosa</i> sp.1				
415	Fabaceae	<i>Mimosa</i> sp.2				
416	Fabaceae	<i>Myrocarpus frondosus</i> Allemão [®]	incienso	EN		DD
417	Fabaceae	<i>Myroxylon peruiferum</i> L. f.	incienso colorado	EN		LC
418	Fabaceae	<i>Parapiptadenia rigida</i> (Benth.) Brenan	kurupa'y rä			LC
419	Fabaceae	<i>Parkinsonia praecox</i> (Ruiz & Pav. ex Hook.) Hawkins	verde olivo			LC

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420	Fabaceae	<i>Peltophorum dubium</i> (Spreng.) Taub.	yvyra pytä			LC
421	Fabaceae	<i>Plathymenia reticulata</i> Benth.	morosyvo sa'yju			LC
422	Fabaceae	<i>Platypodium elegans</i> Vogel				LC
423	Fabaceae	<i>Pterogyne nitens</i> Tul.	yvyraro			NT
424	Fabaceae	<i>Rhynchosia balansae</i> Micheli var. <i>balansae</i>				
425	Fabaceae	<i>Riedeliella graciliflora</i> Harms				
426	Fabaceae	<i>Samanea tubulosa</i> (Benth.) Barneby & J.W. Grimes	manduvi rä			LC
427	Fabaceae	<i>Senna paradictyon</i> (Vogel) H.S. Irwin & Barneby				
428	Fabaceae	<i>Senna pilifera</i> (Vogel) H.S. Irwin & Barneby var. <i>pilifera</i>				
429	Fabaceae	<i>Sesbania exasperata</i> Kunth				
430	Fabaceae	<i>Stryphnodendron rotundifolium</i> Mart.	barbatimao (BR)			
431	Fabaceae	<i>Stylosanthes guianensis</i> (Aubl.) Sw. var. <i>gracilis</i> (Kunth) Vogel				
432	Fabaceae	<i>Stylosanthes</i> sp.1				
433	Fabaceae	<i>Stylosanthes</i> sp.2				
434	Fabaceae	<i>Sweetia fruticosa</i> Spreng.	taperyva guasu			LC
435	Fabaceae	<i>Tachigali aurea</i> Tul.				
436	Fabaceae	<i>Tephrosia</i> sp.				
437	Fabaceae	<i>Zornia latifolia</i> Sm.				
438	Fabaceae	<i>Zornia</i> sp.1				
439	Fabaceae	<i>Zornia</i> sp.2				
440	Fabaceae	<i>Zornia</i> sp.3				
441	Fabaceae	Morfoespecie				
442	Gentianiaceae	<i>Schultesia</i> sp.				
443	Gesneriaceae	<i>Sinningia allagophylla</i> (Mart.) Wiehler	ynambu jety			
444	Hydroleaceae	<i>Hydrolea elatior</i> Schott				
445	Lamiaceae	<i>Aegiphilla verticillata</i> Vell.				
446	Lamiaceae	<i>Cantinoa althaeifolia</i> (Pohl ex Benth.) Harley & J.F.B. Pastore				
447	Lamiaceae	<i>Cantinoa mutabilis</i> (Rich.) Harley & J.F.B. Pastore				

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448	Lamiaceae	<i>Condea elegans</i> (Briq.) Harley & J.F.B. Pastore				
449	Lamiaceae	<i>Hyptis brevipes</i> Poit.				
450	Lamiaceae	<i>Hyptis hirsuta</i> Kunth				
451	Lamiaceae	<i>Hyptis</i> sp.1				
452	Lamiaceae	<i>Hyptis</i> sp.2				
453	Lamiaceae	<i>Hyptis</i> sp.3				
454	Lamiaceae	<i>Ocimum ovatum</i> Benth.				
455	Lamiaceae	<i>Vitex cymosa</i> Bertero ex Spreng.	taruma			LC
456	Lauraceae	<i>Nectandra</i> aff. <i>cissiflora</i> Nees	laurel ne			
457	Lauraceae	<i>Nectandra megaphylla</i> Hassl.				
458	Lauraceae	<i>Ocotea diospyrifolia</i> (Meisn.) Mez	laurel sa'yju			LC
459	Lauraceae	<i>Ocotea minarum</i> (Nees & Mart. ex Nees) Mez				
460	Lentibulariaceae	<i>Utricularia</i> sp.1				
461	Lentibulariaceae	<i>Utricularia</i> sp.2				
462	Lythraceae	<i>Cuphea lysimachioides</i> Cham. et Schltldl.	ysypopere			
463	Lythraceae	<i>Cuphea</i> sp.1				
464	Lythraceae	<i>Cuphea</i> sp.2				
465	Lythraceae	<i>Lafoensia vandelliana</i> Cham. & Schltldl.	morosyvo			
466	Lythraceae	<i>Pleurophora saccocarpa</i> Koehne				
467	Malpighiaceae	<i>Byrsonima intermedia</i> A. Juss.	hi'a municion			
468	Malpighiaceae	<i>Heteropterys glabra</i> Hook. & Arn.				
469	Malpighiaceae	<i>Hiraea fagifolia</i> (DC.) A. Juss.				
470	Malpighiaceae	<i>Janusia guaranítica</i> (A. St.-Hil.) A. Juss.	ysypaviju			
471	Malpighiaceae	<i>Janusia mediterranea</i> (Vell.) W.R. Anderson				
472	Malpighiaceae	Morfoespecie				
473	Malvaceae	<i>Abutilon</i> sp.				
474	Malvaceae	<i>Ayenia krapovickasii</i> Cristobal				
475	Malvaceae	<i>Ayenia tomentosa</i> L.				
476	Malvaceae	<i>Byttneria subsessilis</i> Cristobal				
477	Malvaceae	<i>Ceiba</i> sp.				
478	Malvaceae	<i>Corchorus argutus</i> Kunth				

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				Res. 470/19	Apéndice	
479	Malvaceae	<i>Guazuma ulmifolia</i> Lam.	kamba akä			LC
480	Malvaceae	<i>Helicteres gardneriana</i> A. St.-Hil. & Naudin				
481	Malvaceae	<i>Helicteres lhotzkyana</i> Schum.				
482	Malvaceae	<i>Hibiscus sororius</i> L.f.				
483	Malvaceae	<i>Hochreutinera hasslerana</i> (Hochr.) Krapov.				
484	Malvaceae	<i>Luehea divaricata</i> Mart.	ka'a oveti			DD
485	Malvaceae	<i>Luehea aff. grandiflora</i> Mart.				
486	Malvaceae	<i>Malvastrum coromandelianum</i> (L.) Garcke				
487	Malvaceae	<i>Melochia parvifolia</i> Kunth				
488	Malvaceae	<i>Melochia aff. pilosa</i> (Mill.) Fawc. & Rendle				
489	Malvaceae	<i>Melochia simplex</i> A. St.-Hil.				
490	Malvaceae	<i>Melochia villosa</i> (Mill.) Fawc. & Rendle				
491	Malvaceae	<i>Melochia</i> sp.				
492	Malvaceae	<i>Pavonia</i> sp.				
493	Malvaceae	<i>Peltaea riedelii</i> (Guerke) Standl.				
494	Malvaceae	<i>Pseudobombax tomentosum</i> (Mart. & Zucc.) A. Robyns	mandyju rä			LC
495	Malvaceae	<i>Sida cordifolia</i> L.	malva blanca			
496	Malvaceae	<i>Sida dureana</i> Krapov.				
497	Malvaceae	<i>Sida glomerata</i> Cav.				
498	Malvaceae	<i>Sida linifolia</i> Cav.				
499	Malvaceae	<i>Sida spinosa</i> L.				
500	Malvaceae	<i>Sida</i> sp.1				
501	Malvaceae	<i>Sidastrum paniculatum</i> (L.) Fryxell				
502	Malvaceae	<i>Sterculia striata</i> A. St.-Hil. & Naudin				LC
503	Malvaceae	<i>Triumfetta semitriloba</i> Jacq.				
504	Malvaceae	<i>Waltheria</i> sp.				
505	Malvaceae	Morfoespecie 1				
506	Malvaceae	Morfoespecie 2				
507	Malvaceae	Morfoespecie 3				
508	Melastomataceae	<i>Acisanthera alsinaefolia</i> Tr.				

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509	Melastomataceae	<i>Acisanthera paraguayensis</i> (Hook. f.) Cogn.				
510	Melastomataceae	<i>Miconia</i> sp.				
511	Melastomataceae	<i>Tibouchina</i> sp. 1				
512	Melastomataceae	<i>Tibouchina</i> sp. 2				
513	Melastomataceae	<i>Chaetogastra gracilis</i> (Bonpl.) DC.				
514	Melastomataceae	<i>Clidemia hirta</i> (L.) D. Don				
515	Meliaceae	<i>Guarea guidonia</i> (L.) Sleumer	cedro blanco			LC
516	Meliaceae	<i>Guarea macrophylla</i> Vahl ssp. <i>spiciflora</i> (A. Juss.) T.D. Penn.	cedrillo			LC
517	Meliaceae	<i>Trichilia catigua</i> A. Juss.	katigua pytä			
518	Meliaceae	<i>Trichilia clausenii</i> C. DC.	katigua guasu			
519	Meliaceae	<i>Trichilia elegans</i> A. Juss.	katigua'i			LC
520	Meliaceae	<i>Trichilia pallens</i> C. DC.	katigua morotĩ			NT
521	Meliaceae	<i>Trichilia pallida</i> Sw.	katigua morotĩ			
522	Meliaceae	<i>Trichilia stellato-tomentosa</i> Kuntze		EN		LC
523	Menispermaceae	<i>Cissampelos</i> sp.				
524	Menispermaceae	<i>Odontocarya tamoides</i> (DC.) Miers var. <i>canescens</i> (Miers) Barneby				
525	Menyanthaceae	<i>Nymphoides indica</i> (L.) Kuntze				
526	Menyanthaceae	<i>Nymphoides verrucosa</i> (R.E. Fr.) A. Galan & G. Navarro				
527	Moraceae	<i>Brosimum gaudichaudii</i> Trécul				
528	Moraceae	<i>Dorstenia brasiliensis</i> Lam.	tarope			
529	Moraceae	<i>Dorstenia cayapia</i> Vell. ssp. <i>paraguariensis</i> (Hassl.) C.C. Berg				
530	Moraceae	<i>Ficus</i> aff. <i>enormis</i> (Mart. ex Miq.) Miq.				
531	Moraceae	<i>Ficus calyptroceras</i> (Miq.) Miq.				
532	Moraceae	<i>Ficus pertusa</i> L.f.				
533	Moraceae	<i>Maclura tinctoria</i> (L.) Steud. ssp. <i>tinctoria</i>	tatajyva			LC

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				Res. 470/19	Apéndice	
534	Moraceae	<i>Sorocea sprucei</i> (Baill.) J.F. Macbr. ssp. <i>saxicola</i> (Hassl.) C.C. Berg	María molle			LC
535	Myrtaceae	<i>Campomanesia adamantium</i> (Cambess.) O. Berg	guavira mi			
536	Myrtaceae	<i>Campomanesia sessiliflora</i> (O. Berg) Mattos				
537	Myrtaceae	<i>Campomanesia xanthocarpa</i> O. Berg	guavira pyta			
538	Myrtaceae	<i>Eugenia moraviana</i> O. Berg				
539	Myrtaceae	<i>Eugenia uniflora</i> L.	ñangapiry			
540	Myrtaceae	<i>Myrcianthes pungens</i> (O. Berg) D. Legrand	guaviju			
541	Myrtaceae	<i>Myrciaria cuspidata</i> O. Berg	typycha ka'aguy			
542	Myrtaceae	<i>Psidium grandifolium</i> DC.	katuava	EN		
543	Myrtaceae	<i>Psidium guajava</i> L.	arasa			
544	Myrtaceae	<i>Psidium</i> sp.1	arasa			
545	Myrtaceae	<i>Psidium</i> sp.2				
546	Myrtaceae	<i>Psidium</i> sp.3	arasa			
547	Myrtaceae	<i>Psidium</i> sp.4				
548	Myrtaceae	<i>Psidium</i> sp.5	arasa			
549	Myrtaceae	Morfoespecie 1				
550	Myrtaceae	Morfoespecie 2				
551	Myrtaceae	Morfoespecie 3				
552	Myrtaceae	Morfoespecie 4				
553	Myrtaceae	Morfoespecie 5				
554	Myrtaceae	Morfoespecie 6				
555	Nyctaginaceae	<i>Neea hermaphrodita</i> S. Moore				
556	Nyctaginaceae	<i>Neea pendulina</i> Heimerl				
557	Nyctaginaceae	<i>Pisonia aculeata</i> L.	jagua pinda			LC
558	Nymphaeaceae	<i>Nymphaea prolifera</i> Wiersema				
559	Ochnaceae	<i>Sauvagesia erecta</i> L.				LC
560	Oleaceae	<i>Ximenia intermedia</i> (Chodat & Hassl.) De Filippis				
561	Oleaceae	<i>Menodora integrifolia</i> (Cham. & Schltldl.) Steud.				
562	Oleaceae	<i>Priogymnanthus hasslerianus</i> (Chodat) P.S. Green	ka'a vera			

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563	Onagraceae	<i>Ludwigia filiformis</i> (Micheli) Ramamoorthy				
564	Onagraceae	<i>Ludwigia hassleriana</i> (Chodat) Ramamoorthy				
565	Onagraceae	<i>Ludwigia nervosa</i> (Poir.) H. Hara				
566	Onagraceae	<i>Ludwigia sericea</i> (Cambess.) H.Hara				
567	Onagraceae	<i>Ludwigia</i> sp.				
568	Opiliaceae	<i>Agonandra brasiliensis</i> Miers ex Benth. & Hook. f.				LC
569	Orobanchaceae	<i>Agalinis</i> aff. <i>linarioides</i> (Cham. & Schltdl.) D'Arcy				
570	Orobanchaceae	<i>Buchnera lavandulacea</i> Cham. & Schltdl.				
571	Oxalidaceae	<i>Oxalis sellowii</i> Spreng. var. <i>rosea</i> (Chodat) Lourteig				
572	Oxalidaceae	<i>Oxalis renifolia</i> R. Knuth				
573	Oxalidaceae	<i>Oxalis</i> sp.1				
574	Oxalidaceae	<i>Oxalis</i> sp.2				
575	Passifloraceae	<i>Passiflora cincinnata</i> Mast.	mburucuja			
576	Passifloraceae	<i>Passiflora tricuspis</i> Mast.				
577	Passifloraceae	<i>Passiflora</i> sp.1				
578	Passifloraceae	<i>Passiflora</i> sp.2				
579	Phyllanthaceae	<i>Phyllanthus chacoensis</i> Morong	jakare pito			
580	Phyllanthaceae	<i>Phyllanthus niruri</i> L.	para para'i			
581	Phyllanthaceae	<i>Phyllanthus stipulatus</i> (Raf.) G.L. Webster				
582	Picramniaceae	<i>Picramnia sellowii</i> Planch.				
583	Piperaceae	<i>Peperomia</i> aff. <i>aceroana</i> C. DC.				
584	Piperaceae	<i>Piper subsilvulanum</i> C.DC.				
585	Piperaceae	<i>Piper</i> sp.1				
586	Piperaceae	<i>Piper</i> sp.2				
587	Piperaceae	<i>Piper</i> sp.3				
588	Plantaginaceae	<i>Angelonia integerrima</i> Spreng.				
589	Plantaginaceae	<i>Angelonia perennis</i> (Chodat & Hassler) Scatigna & V.C. Souza				
590	Plantaginaceae	<i>Angelonia salicariifolia</i> Bonpl.				
591	Plantaginaceae	<i>Bacopa salzmännii</i> (Benth.) Wettst. ex Edwall				

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592	Plantaginaceae	<i>Scoparia dulcis</i> L.	Typycha kuratu			
593	Plantaginaceae	<i>Scoparia montevidensis</i> (Spreng.) R. E. Fr.				
594	Plantaginaceae	<i>Stemodia scoparioides</i> Hassl.				
595	Plantaginaceae	Morfoespecie 1				
596	Plantaginaceae	Morfoespecie 2				
597	Polygalaceae	<i>Acanthocladus albicans</i> A.W. Benn.				
598	Polygalaceae	<i>Bredemeyera floribunda</i> Willd.				
599	Polygalaceae	<i>Polygala linoides</i> Poir. var. <i>linoides</i>				
600	Polygalaceae	<i>Polygala molluginifolia</i> A.St.-Hil. & Moq.				
601	Polygalaceae	<i>Securidaca ovalifolia</i> A.St. Hil.				
602	Polygonaceae	<i>Coccoloba</i> sp.				
603	Polygonaceae	<i>Polygonum</i> sp.1				
604	Polygonaceae	<i>Polygonum</i> sp.2				
605	Polygonaceae	<i>Polygonum</i> sp.3				
606	Portulacaceae	<i>Portulaca umbraticola</i> Kunth				
607	Portulacaceae	<i>Portulaca</i> sp.	verdolaga			
608	Primulaceae	<i>Clavija nutans</i> (Vell.) B. Ståhl	jagua ku			
609	Primulaceae	<i>Myrsine guianensis</i> (Aubl.) Kuntze	kanelón			
610	Primulaceae	<i>Myrsine</i> sp.1	kanelón			
611	Rhamnaceae	<i>Gouania latifolia</i> Reissek				
612	Rhamnaceae	<i>Rhamnidium elaeocarpum</i> Reissek	taruma'i			
613	Rhamnaceae	<i>Sageretia lehmanii</i> (Hieron.) Radlk.				
614	Rubiaceae	<i>Borreria poaya</i> A. St.-Hil.) DC.				
615	Rubiaceae	<i>Borreria</i> sp.1				
616	Rubiaceae	<i>Borreria</i> sp.2				
617	Rubiaceae	<i>Calycophyllum multiflorum</i> Griseb.	palo blanco			
618	Rubiaceae	<i>Chomelia obtusa</i> Cham. & Schldl.				
619	Rubiaceae	<i>Cordia sessilis</i> (Vell.) Kuntze	asuka revira			
620	Rubiaceae	<i>Coussarea platyphylla</i> Müll. Arg.				

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621	Rubiaceae	<i>Genipa americana</i> L.	ñandypaguasu			
622	Rubiaceae	<i>Geophila repens</i> (L.) I.M. Johnst.				
623	Rubiaceae	<i>Guettarda viburnoides</i> Cham. & Schltdl.				
624	Rubiaceae	<i>Machaonia brasiliensis</i> (Hoffmanns. ex Humb.) Cham. & Schltdl.				LC
625	Rubiaceae	<i>Mitracarpus</i> sp.				
626	Rubiaceae	<i>Palicourea crocea</i> (Sw.) Roem. & Schult.				
627	Rubiaceae	<i>Psychotria carthagenensis</i> Jacq.				
628	Rubiaceae	<i>Psychotria leiocarpa</i> Cham. & Schltdl.				
629	Rubiaceae	<i>Randia</i> aff. <i>brevituba</i> Judkevich & R.M. Salas	ñuatí kurusu			
630	Rubiaceae	<i>Randia calycina</i> Cham.	ñuatí kurusu			
631	Rubiaceae	<i>Richardia brasiliensis</i> Gomes				
632	Rubiaceae	<i>Richardia grandiflora</i> (Cham. & Schltdl.) Steud.				
633	Rubiaceae	<i>Sipanea hispida</i> Benth. ex Wernham				
634	Rubiaceae	<i>Spermacoce verticillata</i> L.	typycha corredor			
635	Rubiaceae	<i>Spermacoce</i> sp.				
636	Rubiaceae	<i>Staelia virgata</i> (Link ex Roem. & Schult.) K.Schum. var. <i>virgata</i>				
637	Rubiaceae	<i>Staelia</i> sp. 1				
638	Rubiaceae	<i>Tocoyena formosa</i> (Cham. & Schltdl.) K. Schum.				
639	Rubiaceae	<i>Hexasepalum teres</i> (Walter) J.H. Kirkbr.				
640	Rubiaceae	Morfoespecie 1				
641	Rutaceae	<i>Balfourodendron riedelianum</i> (Engl.) Engl.	guatambu	EN		EN
642	Rutaceae	<i>Citrus aurantium</i> L.	apepu			
643	Rutaceae	<i>Helietta apiculata</i> Benth.	yvyra ovi			
644	Rutaceae	<i>Zanthoxylum caribaeum</i> Lam. ssp. <i>rugosum</i> (A. St.-Hil. & Tul.) Reynel	tembetary hü			LC

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645	Rutaceae	<i>Zanthoxylum fagara</i> (L.) Sarg. ssp. <i>fagara</i>	Tembetary mi			
646	Rutaceae	<i>Zanthoxylum petiolare</i> A. St.-Hil. & Tul.	tembetary morotĩ			
647	Rutaceae	<i>Zanthoxylum riedelianum</i> Engl.	tembetary sa'yju			LC
648	Rutaceae	<i>Zanthoxylum rigidum</i> Humb. & Bonpl. ex Willd. ssp. <i>hasslerianum</i> (Chodat) Reynel	pichona titi			
649	Salicaceae	<i>Casearia aculeata</i> Jacq.				LC
650	Salicaceae	<i>Casearia decandra</i> Jacq.				
651	Salicaceae	<i>Casearia gossypiosperma</i> Briq.	mbavy guasu			
652	Salicaceae	<i>Casearia sylvestris</i> Sw.	burro ka'a			LC
653	Salicaceae	<i>Casearia</i> sp.1				
654	Salicaceae	<i>Prockia crucis</i> P. Browne ex L.				
655	Salicaceae	<i>Xylosma venosa</i> N.E. Br.	ñuatĩ pytä			LC
656	Sapindaceae	<i>Allophylus edulis</i> (A. St.-Hil., A. Juss. & Cambess.) Hieron. ex Niederl.	kokü			LC
657	Sapindaceae	<i>Allophylus pauciflorus</i> Radlk.	kokü			
658	Sapindaceae	<i>Averrhoidium paraguayense</i> Radlk.				
659	Sapindaceae	<i>Cardiospermum grandiflorum</i> Sw.	ysypo kamambu			
660	Sapindaceae	<i>Cardiospermum halicacabum</i> var. <i>microcarpum</i> (Kunth) Blume	michĩ ra'yi			
661	Sapindaceae	<i>Cupania vernalis</i> Cambess.	jagua rata'y pyta			LC
662	Sapindaceae	<i>Dilodendron bipinnatum</i> Radlk.	yvyra ruru			
663	Sapindaceae	<i>Magonia pubescens</i> A. St.-Hil.	yvyra hy'a			LC
664	Sapindaceae	<i>Matayba elaeagnoides</i> Radlk.				
665	Sapindaceae	<i>Paullinia elegans</i> Cambess.				
666	Sapindaceae	<i>Paullinia pinnata</i> L.	kururu ape			
667	Sapindaceae	<i>Serjania erecta</i> Radlk.				
668	Sapindaceae	<i>Serjania</i> sp.				
669	Sapindaceae	<i>Talisia angustifolia</i> Radlk.	yvyra'i ka'i			
670	Sapindaceae	<i>Talisia esculenta</i> (Cambess.) Radlk.	karaja bola			

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671	Sapotaceae	<i>Chrysophyllum gonocarpum</i> (Mart. & Eichler) Engl.	aguai			LC
672	Sapotaceae	<i>Chrysophyllum marginatum</i> (Hook. & Arn.) Radlk.	pykasu rembi'u			LC
673	Sapotaceae	<i>Pouteria</i> sp.				
674	Sapotaceae	<i>Sideroxylon obtusifolium</i> (Roem. & Schult.) T.D. Penn.	guajayvirai			LC
675	Solanaceae	<i>Capsicum baccatum</i> L. var. <i>baccatum</i>				
676	Solanaceae	<i>Cestrum guaraniticum</i> Chodat & Hassl.				
677	Solanaceae	<i>Cestrum strigilatum</i> Ruiz & Pav.				
678	Solanaceae	<i>Solanum granulose-leprosum</i> Dunal	hu'i moneha			
679	Solanaceae	<i>Solanum palinacanthum</i> Dunal	tuti'a			
680	Solanaceae	<i>Solanum paniculatum</i> L.				LC
681	Solanaceae	<i>Solanum viarum</i> Dunal	mbói rembi'u			LC
682	Solanaceae	<i>Solanum</i> sp.				
683	Styracaceae	<i>Styrax</i> sp.				
684	Trigoniaceae	<i>Trigonia boliviana</i> Warm.				
685	Turneraceae	<i>Turnera dolichostigma</i> Urb. (ENDEMICA?)				
686	Turneraceae	<i>Turnera grandiflora</i> (Urb.) Arbo	popam yaamit (LENGUA-MASKOY)			
687	Turneraceae	<i>Turnera</i> sp.1				
688	Urticaceae	<i>Cecropia pachystachya</i> Trécul	amba'y			
689	Verbenaceae	<i>Glandularia aristigera</i> (S. Moore) Tronc.				
690	Verbenaceae	<i>Glandularia</i> sp.				
691	Verbenaceae	<i>Lippia lupulina</i> Cham.				
692	Verbenaceae	<i>Lippia sclerophylla</i> Briq.				
693	Verbenaceae	<i>Lippia turnerifolia</i> Cham. var. <i>polytricha</i> (Briq.) Mulgura				
694	Verbenaceae	<i>Lippia turnerifolia</i> Cham. var. <i>turnerifolia</i>				
695	Verbenaceae	<i>Stachytarpheta cayennensis</i> (Rich.) Vahl	tatu ruguái			

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696	Verbenaceae	Morfoespecie 1				
697	Violaceae	<i>Pombalia</i> sp.				
698	Vitaceae	<i>Cissus erosa</i> Rich.	parral saite			
699	Vitaceae	<i>Cissus verticillata</i> (L.) Nicolson & C.E. Jarvis	ka'avurä			
700	Vochysiaceae	<i>Qualea grandiflora</i> C. Mart.				LC

Referencias:

MADES (Nacional) **EN** (En peligro de Extinción) especies categorizadas por la UICN como "EN, CR, DD"; **AE** (Amenazadas de Extinción): especies categorizadas como "VU" por la UICN.

CITES: **Apéndice I**: especies con mayor grado de peligro entre las especies de fauna y de flora, en peligro de extinción. CITES prohíbe el comercio internacional de especímenes de esas especies, salvo cuando la importación se realiza con fines no comerciales, i.e. para la investigación científica. **Apéndice II**: especies que no están necesariamente amenazadas de extinción pero que podrían llegar a estarlo a menos que se controle estrictamente su comercio.

Description of vegetal formations

DEGRADED HIGH FOREST



Degraded high forest - San Liberato (L. Pérez de Molas)

Alcanza una altura de 16-18 m. Las especies del **estrato superior** *Talisia esculenta* (karaja bola), *Holocalyx balansae* (yvyra pepe), *Guibourtia hymenaefolia* (kuruñai), *Albizia niopoides* (yvyra ju), *Guarea guidonia* (cedro blanco), *Cordia americana* (guajayvi), *Balfourodendron riedelianum* (guatambu), *Aspidosperma pyrifolium* (palo rosa), *Cupania vernalis* (jagua rata'y pytã), las especies del **Estrato medio** *Myrciaria cuspidata* (typycha ka'aguy), *Amburana cearensis* (trébol), *Astronium fraxinifolium* var. *glabrum* (urunde'y para morotĩ), *Peltophorum dubium* (yvyra pytã), *Casearia gossypiosperma* (mbavy guasu), *Aspidosperma pyrifolium* (palo rosa), *Chrysophyllum gonocarpum* (aguai), *Parapiptadenia rigida* (karupa'y rä), *Casearia gossypiosperma* (mbavy guasu), *Helietta apiculata* (yvyra ovi), *Maclura tinctoria* ssp. *tinctoria* (tata jyva), *Cordia americana* (guajayvi), *Guibourtia hymenaefolia* (kuruñai), *Albizia niopoides* (yvyra ju), **Estrato inferior** *Actinostemon conceptionis*, *Philyra brasiliensis*, *Trichilia catigua* (katigua pytã), *Neea pendulina*, *Myrciaria cuspidata* (typycha ka'aguy), *Annona emarginata* (aratiku'i),

Randia calycina (ñuatĩ kurusu), *Casearia* sp.1, *Combretum leprosum*, *Attalea phalerata* (guacuri), *Randia* aff. *brevituba* (ñuatĩ kurusu), *Allophylus pauciflorus* (kokũ), *Prockia crucis*, *Celtis iguanaea* (juasy'y).

El **sotobosque** es ralo, conformado por herbáceas, lianas, regeneración natural. Las especies presentes son *Dasyphyllum* sp., *Laciasis sorghoidea*, *Tocoyena formosa*, *Piper* sp.1, *Doryopteris pentagona*, *Justicia brasiliana*, *Geophila repens*, *Oeceoclades maculata* (orquídea burrito), Epífitas como *Microgramma vacciniifolia* (anguja ruguai), *Pleopeltis minima*, Lianas como *Hippocratea volubilis*, *Dalechampia* sp..

En algunos sectores el sotobosque presenta dominancia de *Actinostemon conceptionis* y *Acanthocladus albicans*.

Se registró regeneración natural de *Trichilia elegans* (katiagua'i), *Protium heptaphyllum* (yvya ysy), *Parapiptadenia rigida* (kurupa'y ra), *Ocotea diospyrifolia* (laurel sa'yju), *Rhamnidium elaeocarpum* (taruma'i), *Myrcianthes pungens* (guaviju), *Myrcarpus frondosus* (incienso), *olocalyx balansae* (yvya pepe), *Amburana cearensis* (trébol), *Aspidosperma pyriformium* (palo rosa), *Trichilia pallida* (katigua morotĩ), *Actinostemon conceptionis*, *Allophylus pauciflorus* (kokũ).

En el borde y orilla del camino están presentes *Cordia trichotoma* (peterevy) y *Celtis iguanaea* (juasy'y). El suelo es arenoso, cubierto de hojarasca, con depresiones que forman áreas de acumulación de agua, muchos claros pequeños invadido por Pasto colonial.

Relevos:

EM2L: Coordenadas: 22° 30' 17"S 57° 51' 35" W, Altitud 215 msnm

EM3L: Coordenadas: 22° 39' 10,4"S 56° 51' 50,9" W, Altitud 197,43 msnm

TRANSITIONAL (ECOTONAL) FOREST BETWEEN DEGRADED HIGH FOREST AND CERRADON



Transitional (ecotonal) forest (high forest – cerradon) - Gavilan(L. Pérez de Molas)

Final report.

Biodiversity Baseline Study of Parcel Properties. Parcel S.A.
May 2021.

Alcanza una altura de hasta 11 m. **Estrato superior** Inga uraguensis (inga guasu), Astronium fraxinifolium var. Glabrum (urunde'y para morotĩ), Guarea guidonia (cedro blanco), Protium heptaphyllum (yvya ysy), Casearia gossypiosperma (mbavy guasu), Styrax sp., **Estrato medio** Trichilia pallens (katigua morotĩ), Trichilia pallida (katigua morotĩ) **Estrato inferior**: Peltophorum dubium (yvya pytã), Casearia sp.1, Piper sp.1, Cordiera sessilis (asuka revira), Agonandra brasiliensis.

En el borde del bosque aparecen Didymopanax morototoni (amba'y guasu), Parapiptadenia rigida (kurupa'y rã), Enterolobium contortisiliquum (timbó), Anadenanthera colubrina var. cebil (kurupa'y kuru).

Sotobosque: Myrsine sp., Rhamnidium elaeocarpum (taruma'i), lianas como Forsteronia glabrescens (ysypo kamby), Prockia crucis, Trichilia catigua (katigua pytã), Piper sp.1 Se observó además abundante regeneración natural.

En algunos sectores este bosque alcanza una altura de solo 5-7 m, con emergentes de hasta 9 m dominado por Attalea phalerata (guacuri). Las especies del **Estrato superior** Myracrodruon urundeuva (urunde'y mi), Sapium haemathospermum (kurupika'y), Attalea phalerata (guacuri), Ficus sp. (guapo'y), en el **Estrato medio** Samanea tubulosa (manduvi rã), Attalea phalerata (guacuri), Machaerium acutifolium, Ocotea diospyrifolia (laurel sa'yju), Protium heptaphyllum (yvya ysy), Casearia sp.1 **Estrato inferior** Helicteres lhotzkiana, Maclura tinctoria ssp. Tinctoria (tata jyva), Guarea guidonia (cedro blanco) y Attalea phalerata (guacuri).

El sotobosque es casi ausente, pocas lianas y muy poca regeneración natural. El suelo es arenoso, cubierto de abundante hojarasca. La topografía con pendiente suave.

Relevos:

EM2G Coordenadas: 22° 40' 20,3''S 56° 53' 44,7'' W, Altitud 155 msnm

EM3G Coordenadas: 22° 40' 20,3''S 56° 53' 44,3'' W, Altitud 164 msnm

RIPARIAN FOREST



Riparian Forest - Trementina stream (L. Pérez de Molas)



Riparian Forest - Gavilan (unnamed stream) (L. Pérez de Molas)

Se desarrolla en ribera del Arroyo Trementina, afluente de la margen derecha del Río Aquidabán.

Alcanza una altura de 16-18 m. **Estrato superior:** *Peltophorum dubium* (yvyra pytã), *Anadenanthera colubrina* var. *cebil* (kurupa'y kuru), *Protium heptaphyllum* (yvyra ysy), *Aspidosperma pyriforme* (palo rosa), *Inga uraguensis* (inga pytã), *Copaifera langsdorfii* (kupa'y), *Handroanthus heptaphyllus* (tajy hu)

Estrato medio: *Chrysophyllum marginatum* (pykasu rembi'u), *Sorocea sprucei* (Maria molle), *Albizia niopoides* (yvyra ju), *Phyllanthus chacoensis* (jakare pito), *Enterolobium contortisiliquum* (timbo), *Garcinia brasiliensis* (pakuri), *Eugenia uniflora* (ñangapiry), *Salacia elliptica* (pakuri brasileiro), *Protium hetaphyllum* (yvyra ysy), *Chrysophyllum gonocarpum* (aguai), *Plathymenia reticulata* (morosyvo), *Coussarea platyphylla*, *Terminalia triflora* (guajayvi sa'yju), *Genipa americana* (ñandypa guasu), *Guibourtia hymenaefolia* (kuruñai), *Vitex cymosa* (taruma), *Attalea phalerata* (guacuri), *Ocotea diospyrifolia* (laurel sa'yju), *Casearia gossypiosperma* (mbavy guasu), **Estrato inferior** *Casearia gossypiosperma* (mbavy guasu), *Salacia elliptica* (pakuri brasileiro), *Parapiptadenia rigida* (kurupa'y rä), *Trichilia catigua* (katigua pytã), *Aspidosperma cylindrocarpon*, *Handroanthus ochraceus* (tajy sa'yju), *Garcinia brasiliensis* (pakuri), *Myrciaria cuspidata* (typycha ka'aguy), *Acanthocladus albicans*, *Cordia sessilis* (asuka revira), *Zanthoxylum petiolare* (tembetary morotĩ), *Randia* aff. *brevituba* (ñuatĩ kurusu), *Coccoloba* sp., *Jacaranda mimosifolia* (jagaranda), *Guarea macrophylla* ssp. *spiciflora* (cedrillo), *Annona emarginata* (aratiku'i), *Trichilia pallens* (katigua morotĩ), *Machaonia brasiliensis*, *Miconia* sp., *Trichilia pallida* (katigua morotĩ), *Randia calycina* (ñuatĩ kurusu), *Bactris glaucescens* (karanda), *Coussarea platyphylla*, *Acanthocladus albicans*, *Celtis iguanaea* (juasy'y).

En algunos sectores del bosque *Guadua chacoensis* (takuara), formando pequeñas colonizaciones llegando hasta la orilla del curso principal, ocupando el segundo estrato del bosque. En los bordes *Annona nutans* (aratiku ñu) y *Machaerium hirtum*.

El **sotobosque** es ralo, con mucha hojarasca, el suelo es arenoso, con muy pocas lianas. Abundante regeneración natural de Myrtaceae e *Inga uraguensis* (inga guasu). Lianas: *Pisonia aculeata* (jagua pinda), *Forsteronia glabrescens* (ysypo kamby) y *Forsteronia pubescens*. Epifitas: *Microgramma vacciniifolia* (anguja ruguai), *M. persicariifolia*, *Polypodium* sp., *Rhipsalis* sp., *Campylocentrum* cfr. *neglectum* y otras herbáceas terrestres como *Adiantum latifolium* y *A. serrato-dentatum*.

También están presentes *Actinostemon conceptionis*, *Annona neosalicifolia* (Aratiku), *Syagrus romanzoffiana* (pindo), *Psychotria* sp., *Clavija nutans* (tumby rasy poha), *Acanthocladus albicans*, *Randia* aff. *brevituba* (ñuatĩ kurusu).

Relevos:

EM1T Coordenadas: 22° 43' 56,1''S 56° 51' 16,3'' W, Altitud 143 msnm

EM2T Coordenadas: 22° 43' 10,8''S 56° 52' 45,3'' W, Altitud 131 msnm

PO1T Coordenadas: 22° 43' 53''S 56° 51' 12'' W, Altitud 136 msnm

PO7L Coordenadas: 22° 37' 54''S 56° 54' 01,2'' W, Altitud 142 msnm

RIPARIAN FORESTAL IN GAVILAN (unnamed stream)

Bosque 8-10 m de altura. **Estrato superior:** *Ocotea diospyrifolia* (laurel sa'yju), *Trichilia pallida* (katigua morotĩ), *Genipa americana* (ñandypa guasu), *Samanea tubulosa* (manduvirá), *Guibourtia hymenaefolia* (kuruñai), *Sapium haematospermum* (kurupika'y), *Peltophorum dubium* (yvyra pytã), *Cordia americana* (guajayvi), *Inga uraguensis* (inga guasu), **Estrato medio:** *Cupania vernalis* (jagua rata'y pytã), *Salacia elliptica* (pakuri brasileiro), *Chrysophyllum gonocarpum* (aguai), *Citrus aurantium* (apepu), *Trichilia pallida* (katigua morotĩ), *Attalea phalerata* (guacuri), *Syagrus romanzoffiana* (pindo), *Acrocomia aculeata*

(mbokaja), Terminalia triflora (guajayvi sa'yju) **Estado Inferior:** Trichilia catigua (katigua pytä), Trichilia pallens (katigua morotĩ), Casearia sylvestris (burro ka'a), Protium heptaphyllum (yvya ysy), Randia calycina (ñuatĩ kurusu) y Celtis sp.1 (juasy'y).

En el **sotobosque** están presentes Forsteronia glabrescens (ysypo kamby), Bromelia balansae (karaguata), Tocoyena formosa, Laciasis sp. y Miconia sp.

Existe abundante regeneración natural de especies arbóreas.

Relevos:

EM4G Coordenadas: 22° 40' 3,1''S 56° 53' 44,3'' W, Altitud 143 msnm

RIPARIAN FOREST (unnamed stream) (POTRERO ITA JURU)



Riparian forest - Soledad (L. Pérez de Molas)

Bosque 16-18 m. **Estrato superior:** Enterolobium contortisiliquum (timbo), Syagrus romanzoffiana (pindo), Guazuma ulmifolia (kamba akã), Cordia americana (guajayvi), Peltophorum dubium (yvya pytä), Casearia gossypiosperma (mbavy guasu), Genipa americana (ñandypa guasu), Balfourodendron riedelianum (guatambu), Annona neosalicifolia (aratiku), **Estrato medio:** Trichilia catigua (katigua pytä), Sebastiania sp.1 (yvya kamby), Holocalyx balansae (yvya pepe), Averrhoidium paraguayense, Chrysophyllum gonocarpum (aguai), Maclura tinctoria ssp. tinctoria (tata jyva), Sebastiania sp. 2 (yvya kamby), Samanea tubulosa (manduvirã), Parapiptadenia rigida (kurupa'y rã), Cupania vernalis (jagua rata'y pytä), Genipa americana (ñandypa guasu), Ocotea diospyrifolia (laurel sa'yju) **Estrato inferior:** Picramnia sellowii, Casearia gossypiosperma (mbavy guasu), Myrcianthes pungens (guaviju), Eugenia moraviana, Cupania vernalis (jaguarata'y pytä), Terminalia triflora (guajayvi sa'yju), Trichilia elegans

(katigua'i), *Randia calycina* (ñuatĩ kurusu), *Guarea macrophylla* ssp. *spiciflora* (cedrillo), *Tabernaemontana catharinensis* (sapiranguy), *Casearia sylvestris* (burro ka'a), *Sebastiania* sp.1, *Terminalia triflora* (guajayvi sa'yju), *Parapiptadenia rigida* (kuruap'y rã), *Sorocea sprucei* (María molle) e *Inga uraguensis* (inga guasu).

El **sotobosque** presenta manchones aislados de *Pseudananas sagenarius* (yvira), y *Merostachys clausenii* (takuapi), además de *Trichilia elegans* (katigua'i), *Guarea macrophylla* ssp. *spiciflora* (cedrillo) y *Psychotria leiocarpa*. Se observó pocas lianas, solo *Forsteronia glabrescens* (ysypo kamby), las epífitas presentes fueron *Thaumatococcus undulatum* (guembe), *Pleopeltis minima* y *Microgramma vacciniifolia* (anguja ruguai), herbáceas terrestres como *Geophila repens*, *Pharus lappulaceus*, *Pteris denticulata*, *Adiantopsis radiata* (helecho sombrilla), *Asplenium clausenii*, Cfr. *Hippeastrum* sp. (lirio), *Acalypha* sp.1, y *Desmodium* sp.1.

La regeneración natural es abundante y diversa. Están presentes *Averrhoidium paraguayense*, *Guibourtia hymenaefolia* (kuruñai), *Salacia elliptica* (pakuri brasileiro), *Chrysophyllum gonocarpum* (aguai), *Trichilia clausenii* (catigua guasu), *Monteverdia ilicifolia* (kangorosa), *Trichilia catigua* (katigua pytã), *Balfourodendron riedelianum* (guatambu), *Rhamnidium elaeocarpum* (taruma'i), *Cupania vernalis* (jagua rata'y pytã).

El suelo es arenoso, con mucha materia orgánica. El arroyo corre encajonado, el agua es poco profunda, formando una barranca de aproximadamente tres metros, en algunos sectores corre sobre lecho rocoso, formando pequeños rápidos. El agua es de color blanquecino.

Relevos:

EM2S Coordenadas: 22° 39' 40''S 57° 12' 4,0'' W, Altitud 213 msnm

EM3S Coordenadas: 22° 39' 52,6''S 57° 12' 5,3'' W, Altitud 213 msnm

RIPARIAN FOREST SAN LIBERATO (Unnamed stream)

Bosque de hasta 10 m. **Estrato Superior:** *Handroanthus impetiginosus* (lapacho rosado), *Copaifera langsdorfii* (kupa'y), *Cordia glabrata* (peterevy morotĩ), *Syagrus romanzoffiana* (pindo), *Handroanthus pulcherrimus* (tajy sa'yju), *Aspidosperma cylindrocarpon* (palo rosa), *Annona neosalicifolia* (aratiku), *Myracrodruon urundeuva* (urunde'y mi), *Albizia niopoides* (yvira ju), *Aspidosperma australe* (kirandy), *Guibourtia hymenaefolia* (kuruñai) **Estrato medio:** *Casearia gossypiosperma* (mbavy guasu), *Inga uraguensis* (inga guasu), *Genipa americana* (ñandypa guasu), *Eugenia uniflora* (ñangapiry), *Sapium haematospermum* (kurupika'y), *Ocotea diospyrifolia* (laurel sa'yju), *Terminalia argentea* (capitán), *Salacia elliptica* (pakuri brasileiro), *Miconia* sp., *Protium heptaphyllum* (yvira ysy), *Machaerium hirtum*, *Garcinia brasiliensis* (pakuri), *Allophylus edulis* (kokũ), *Astronium urundeuva* (urunde'y mi) y *Anadenanthera colubrina* var. *cebil* (kurupa'y kuru) **Estrato inferior:** *Parapiptadenia rigida* (kurupa'y rã), *Casearia sylvestris* (burro ka'a), *Celtis iguanaea* (juasy'y), *Cordia sessilis* (asuka revira), *Chrysophyllum marginatum* (pykasu rembi'u), *Sorocea sprucei* ssp. *saxicola* (María molle), *Chomelia obtusa*, *Zanthoxylum rigidum* ssp. *hasslerianum* (tembetary), *Zanthoxylum petiolare* (tembetary morotĩ), *Neea pendulina*, *Myrciaria cuspidata* (typycha ka'aguy) y *Actinostemon conceptionis*.

El **sotobosque** es ralo, la hojarasca cubriendo totalmente el suelo, fueron registradas *Adiantum latifolium*, *Dorstenia brasiliensis* (tarope), *Scleria* sp., *Anemia* sp., *Pseudananas sagenarius* (yvira), *Hemionitis tomentosa* (doradilla), *Oeceoclades maculata* (orquídea burrito), *Manihot* sp.1, las lianas

presentes son *Smilax* sp., *Forsteronia pubescens*, *F. glabrescens* (ysypo kamby), *Lygodium volubile*. Las pocas epífitas están representadas por *Thaumatococcus undulatum* (guembe) y *Tillandsia liliacea* (clavel del aire).

Relevos:

EM1L Coordenadas: 22° 40' 5,9''S 56° 49' 40,1'' W, Altitud 157 msnm

PO1L Coordenadas: 22° 40' 5,9''S 56° 49' 40,1'' W, Altitud 157 msnm

CERRADON



Cerradón - Soledad (L. Pérez de Molas)



Cerradón - San Liberato (L. Pérez de Molas)

Alcanza una altura de 14 m – 16 m. **Estrato superior:** *Amburana cearensis* (trebol), *Terminalia argentea* (capitán), *Myracrodruon urundeuva* (urunde'y mi), *Dilodendron bipinnatum*, *Enterolobium timbouva* (timbo), *Anadenanthera colubrina* var. *cebil* (kurupa'y kuru), *Pseudobombax tomentosum* (mandyju rã), *Tabebuia aurea* (paratodo), **Estrato medio:** *Averrhoidium paraguaiense*, *Magonia pubescens* (yvya hy'a), *Pseudobombax tomentosum* (mandyju rã), *Cordia americana* (guajayvi), *Acrocomia aculeata* (mbokaja), *Stryphnodendron rotundifolium* (barbatimao), *Myracrodruon urundeuva* (urunde'y mi), *Zanthoxylum caribaeum* ssp. *rugosum* (tembetary hũ), *Casearia gossypiosperma* (mbavy guasu), *Aspidosperma pyriforme* (palo rosa), *Luehea divaricata* (ka'a oveti) *Sterculia striata*, *Dimorphandra mollis* (lorito pysã), *Trichilia pallens* (katigua moroti), *Handroanthus ochraceus* (tajy sa'yju), *Aspidosperma tomentosum* (kirandy del cerrado), *Acrocomia aculeata* (mbokaja), *Syagrus romanzoffiana* (pindo), *Astronium fraxinifolium* var. *glabrum* (urunde'y para moroti), *Cecropia pachystachya* (amba'y), *Prigymnanthus hasslerianus* (ka'a vera), *Annona neosalicifolia* (aratiku), *Agonandra brasiliensis*, *Sapium haematospermum* (kurupika'y), *Samanea tubulosa* (manduvi rã), *Helietta apiculata* (yvya ovi) **Estrato inferior:** *Acosmium subelegans*, *Erythroxylon suberosum*, *Rhamnidium elaeocarpum* (taruma'i), *Tabebuia roseo-alba* (tajy moroti), *Xylopia aromatica*, *Annona emarginata* (aratiku'i), *Tocoyena formosa*, *Plenckia populnea*, *Luehea divaricata* (ka'a oveti), *Casearia gossypiosperma* (mbavy guasu), *Ocotea minarum*, *Protium heptaphyllum* (yvya ysy), *Dilodendron bipinnatum* (yvya ruru), *Myrsine* sp. (kanelon), *Guettarda viburnoides*, *Coussarea platyphylla*, *Astronium fraxinifolium* var. *glabrum* (urunde'y para moroti), *Attalea phalerata* (guacuri), *Trichilia stellato-tomentosa*, *Celtis* sp.1 (juasy'y), *Duguetia furfuracea*, *Chrysophyllum marginatum* (pykasu rembi'u).

En el **sotobosque** están presentes *Smilax* sp. (ju'a peka), *Bromelia balansae* (karaguata), *Bromelia serra* (karaguata), *Scleria* sp., *Piper* sp.2, *Forsteronia glabrescens* (ysypo kamby), *Bauhinia cheilantha*, *B. cfr. mollis*, *Forsteronia pubescens*, *Passiflora* sp.1, *Passiflora* sp.2., *Ruellia angustiflora*, *Croton* sp.4, *Randia calycina* (ñuatĩ kurusu), *Trichilia stellato-tomentosa*, *Dorstenia cayapia* ssp. *paraguariensis* (tarope),

Brosimum gaudichaudi, *Campomanesia adamantium* (guavira mi), *Lasiacis* sp., *Bulbophyllum* sp., *Trichocentrum morenoi*, *Adiantum serrato-dentatum*, *Odontocarya tamoides* var. *canescens*, *Randia calycina* (ñuatĩ kurusu).

En los bordes *Bauhinia* sp., *Prestonia tomentosa*, *Sapium haematospermum* (kurupika'y), *Myrsine* sp. (kanelón), *Jacaranda mimosifolia* (jakaranda), *Lygodium volubile*, *Annona emarginata* (aratiku'i).

En la transición del Campo Cerrado con el Cerradón, están presentes *Cereus stenogonus* (tuna), *Bromelia balansae* (karaguata), *Acrocomia aculeata* (mbokaja), *Dimorphandra mollis* (lorito pysa), *Agonandra brasiliensis*, *Tocoyena formosa*, *Aspidosperma tomentosum* (kirandy del cerrado), *Pouteria* sp. y *Duguetia furfuracea*,

Se registró la regeneración de las especies: *Dilodendron bipinnatum* (yvyra ruru), *Trichilia clausenii* (katigua guasu), *Bauhinia forficata* ssp. *pruinosa* (pata de buey), *Tabebuia roseo-alba* (tajy morotĩ), *Allophylus edulis* (kokũ), *Annona emarginata* (aratiku'i), *Guazuma ulmifolia* (kamba akã), *Cordia americana* (guajayvi), *Anadenanthera colubrina* var. *cebil* (kurupa'y kuru), *Amburana cearensis* (trebol), *Astronium fraxinifolium* var. *glabrum* (urunde'y para morotĩ), *Averrhoidium paraguayense*, *Pseudobombax tomentosum* (mandyju rã), *Syagrus romanzoffiana* (pindo), *Celtis* sp.1 (juasy'y), *Zanthoxylum rigidum* ssp. *hasslerianum* (tembetary), *Myrsine* sp. (kanelón), *Chrysophyllum marginatum* (pykasu rembi'u), *Cupania vernalis* (jagua rata'y pytã), *Trichilia stellato-tomentosa*, *Enterolobium timbouva* (timbo), *Trichilia catigua* (katigua pytã), *Tabebuia aurea* (paratodo), *Salacia elliptica* (pakuri brasileiro).

El suelo es arenoso, con abundante hojarasca, evidencia de incendios, invasión de *Megathyrsus maximus* (Jack.) B. K. Simon & S.W.L. Jacobs var. *maximus* (pasto colonial) en los claros.

Relevos:

EM5S Coordenadas: 22° 36' 35,6''S 57° 08' 59,2'' W

EM6S Coordenadas: 22° 36' 24,6''S 57° 08' 47,1'' W, Altitud 263 msnm

EM4L (Isleta) Coordenadas: 22° 39' 8,9''S 56° 52' 8'' W, Altitud 193 msnm

PO6L (arena blanca) Coordenadas: 22° 36' 56,4''S 56° 53' 27,4'' W, Altitud 163 msnm

CAMPO CERRADO



Campo cerrado - Soledad (L. Pérez de Molas)

Formación sabánica caracterizada por la dominancia de subarbustos con sistema de xylopodio desarrollado, evidencia de quemas. El suelo es arenoso, con afloramientos rocosos (Granito) en las lomas. La roca madre está presente a unos 10 cm de profundidad, el terreno presenta fuerte pendiente hacia el este.

Especies dominantes *Campomanesia adamantium* (guavira mi), *Angelonia integerrima*, *Bidens chodatii*, *Butia* sp., *Acrocomia hassleri* (mbokaja'i), *Croton glandulosus*, *Croton* spp., *Rhynchospora setigera*, varias especies de Poaceae y Cyperaceae, *Arachis pflugeae*, *Arachis nitida*, *Cenostigma marginatum*, *Senna paradyction*, *Borreria poaya*, *Eryngium sanguisorba*, *Ocimum ovatum*, *Microstachys hispida*, *Ruellia multifolia* var. *viscosissima*, *Aristida* sp., *Abildgaardia ovata*, *Annona dioica* (aratiku), *Oedochloa procurrens*, *Eriosema* sp., *Camptosema* sp., *Passiflora* sp.1, *Psidium* spp., *Cnidocolus albomaculatus*, *Lippia lupulina*, *Ipomoea* spp., *Bulbostylis spheroccephala*, *Evolvulus sericeus*, *Froelichia procera*, *Pouteria* sp., *Bromelia balansae* (karaguata), *Aspilia* sp., *Chrysolaena cognata* (jagua ra'ji), *Ayenia* sp., *Mandevilla petrea*, *M.aff. pohliana*, *Discocactus hartmanii*, *Lippia* sp., *Erythroxyton suberosum*, *E. cuneifolium* (coca del monte), *Buchnera* aff. *longifolia* entre otros.

En San Liberato se registró en esta formación la presencia predominante de *Talisia angustifolia*, ocupando extensas áreas, alternando con matas aisladas de diversas especies de poaceas. En áreas de transición con el Cerradón se observó igualmente, poblaciones casi puras de *Pouteria* sp. y *Cyclolobium brasiliensis* y *Bromelia balansae* (karaguata), como así también regeneración de *Handroanthus ochraceus* (tajy sa'yju) y *Sapium haemathospermum* (kurupika'y).

Relevo: EM1S Coordenadas: 22° 39' 46,7''S 57° 12' 11,2'' W, Altitud 219 msnm

CERRADO CAMPO SUCIO (GAVILÁN, SAN LIBERATO)

Campo sucio - Gavilán (L. Pérez de Molas)

Campo sucio -San Liberato (L. Pérez de Molas)

En Gavilán, formación caracterizada por presencia de especies con una altura máxima de 1,6 m, vegetación arbustiva, el suelo es arenoso, semicubierto con manchones de *Paspalum* sp. (pasto cavaju), arbustos formando grandes matas, presenta evidencia de ingreso de ganado vacuno y senderos.

En San Liberato, con menor cantidad de especies, evidencia de degradación, como mucho suelo desnudo, compactado, sobrepastoreado, ramoneado y rastros de quema.

Las especies características registradas *Talisia angustifolia*, *Anacardium humile* (*kaju'i*), *Byrsonima* sp., *Pouteria* sp., *Zornia* sp.1, *Annona dioica* (*aratiku*), *Schinus weinmannifolius* (*molle'i*), *Duguetia furfurácea* (*aratiku hata*), *Cnidocolus albomaculatus*, *Annona nutans* (*aratiku ñu*), *Campomanesia adamantium* (*guavira mi*), *Annona emaginata* (*aratiku'i*), *Syagrus campylospatha* (*jata'i mi*), *Calliandra brevicaulis* var. *brevicaulis* (*niño azote*), *Orthopapus angustifolius*, *Adesmia* sp., *Psidium* sp.2, *Tocoyena formosa*, *Croton glandulosus*, *Croton* sp.1, *Forsteronia pubescens*, *F. glabrescens* (*ysypo kamby*), *Eriosema* sp., *Scoparia dulcis* (*typycha kuraty*), *Melochia villosa*, *M. parvifolia*, *Spermacoce verticillata* (*typycha corredor*), *Scleria* sp., *Sida cordifolia* (*malva blanca*), *Andropogon lateralis* (*kapi'i pytä*), *Hyptis* spp., *Desmodium* sp.1 (*taha taha*), *Acisanthera* sp., *Tibouchina* sp., *Pfaffia* sp., *Bromelia balansae* (*karaguata*), *Evolvulus sericeus*, *Trixis* sp., *Rhynchospora* sp.1, *Arachis nitida*, *Arachis paraguariensis* ssp. *paraguariensis*, *Eupatorium* sp.1, *Angelonia integerrima*, *Mandevilla petrea*, *Bidens gardneri*, *Dorstenia brasiliensis* (*tarope*), *Paspalum* sp.3 (*kapi'i pe kavaju*) entre otras.

Es muy frecuente observar la presencia de isletas en contacto con las formaciones de sabanoides. Algunas especies características en estas isletas son: *Zanthoxylum rigidum* ssp. *hasslerianum* (*Tembetary*), *Myrsine* sp. (*Kanelon*), *Chrysophyllum marginatum* (*Pykasu rembi'u*), *Chomelia obtusa*, *Dimorphandra mollis* (*Lorito pysa*), *Tabernaemontana catharinensis* (*Sapirangy*), *Acanthocladus albicans*, *Psidium* sp.1 (*Arasa*), *Bidens pilosa* (*Kapiuna*), *Stachytarpheta cayennensis* (*Tatu ruguai*), *Cestrum* sp., *Solanum* sp., *Spermacoce verticillata* (*Typycha corredor*), *Melochia parvifolia*, *Mimosa* sp.2 (*Jukeri*), *Smilax* sp. (*Ju'a peka*) y en áreas de bordura, poblaciones puras de *Bromelia balansae* (*Karaguata*).

Relevos:

EM5G Coordenadas: 22° 37' 37,3''S 56° 57' 3,5'' W, Altitud 182 msnm

PO4L Coordenadas: 22° 38' 9,8''S 56° 53' 47,2'' W Altitud: 146 msnm

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May 2021.

FLOODABLE SAVANNA (GAVILAN, SOLEDAD, TREMENTINA)



Savana Inundable en Soledad (L. Pérez de Molas)

Vegetación acuática palustre en cuerpo de agua en Trementina (L. Pérez de Molas)

En Gavilán, en área de plantación de *Eucalyptus camaldulensis*, de aproximadamente 10 años de edad, con pastos de hasta 80 cm y leñosas creciendo aisladamente, de hasta 2 m. Se registraron *Pleurophora saccocarpa*, *Ludwigia* sp., *Echinodorus grandiflorus* (cucharero), *Pontederia cordata* (camalote), *Heteropterys* sp., *Aeschynomene* sp.1, *Paspalum* spp., *Eupatorium* spp., *Eleocharis elegans*, *Aspilia montevidensis*, *Caperonia* aff. *castaneifolia*, *Cuphea lysimachioides* (*ysypo pere*), *Rhynchospora* spp., *Melochia simplex* entre otras.

En formación similar en Gavilán, sobre suelo areno-arcilloso (arena fina) gris, húmedo, se registraron también especies de la familia Poaceae del género *Paspalum* sp. creciendo en matas grandes, con inflorescencias que alcanzan hasta 2,5 m. Otras especies registradas fueron: *Psidium* sp.3 (*arasa*), *Sisyrinchium* sp., *Stylosantes* sp., *Setaria* sp., *Annona nutans* (*aratiku*), *Rhynchospora* sp., *Oedochloa procurrans*, *Imperata brasiliensis* (*jahape*), *Mimosa* spp. (*jukeri*), *Eleocharis* spp., *Hyptis* spp., *Cipura paludosa* ssp. *boliviensis*, entre otras.

Se observó la presencia de senderos, rodeados de bosque de galería y bosque bajo de 8-10m. Ejemplares aislados de *Sapium haematospermum* (*kurupika'y*), *Cecropia pachystachya* (*amba'y*), *Myracrodruon urudeuva* (regeneración), *Allophylus edulis* (*kokū*), *Schinus weinmanniifolius* (*molle'i*), *Acrocomia aculeata* (*mbokaya*), *Butia paraguariensis* (*jata'i*).

La formación de esta categoría observada en Soledad, presentó como dominante a las especies de la familia Poaceae, con alturas de 0,9-1 m e inflorescencias de hasta 2,5 m. El suelo es oscuro, negruzco, húmedo y en partes más elevadas con anchas y profundas grietas y rastros de quema.

Se registraron: *Paspalum* sp., *Lobelia* aff. *nummularioides*, *Ludwigia hassleriana*, *L. nervosa*, *Rhynchospora* spp., *Cyperus* spp., *Lippia* sp., *Fimbristylis* sp., *Melochia parvifolia*, *Mikania* sp., *Acalypha* sp.2, *Heteropteris* sp., cfr. *Hymenachne* sp.

En zonas de topografía más alta, se registraron: *Stillingia* aff. *salpingadenia*, *Desmodium* sp.2, *Oxypetalum* sp., entre otras especies.

En Trementina se registró la presencia de una laguna vegetada, con una superficie 80 x 50 m, cuyo posible origen fue el represamiento de un cauce hídrico. Se relevaron las siguientes especies enraizadas en el fondo: *Eleocharis elegans* y *Eleocharis* sp. (dominantes), manchones de *Pontederia azurea* (*aguape puru'a*); en el borde, pero dentro del agua *Utricularia* sp., *Lemna minuta*, *Pontederia cordata* (camalote)

y *Nymphoides verrucosa*. En el borde y rodeando el cuerpo del agua se presentan *Ludwigia* sp., *Scoparia dulcis* (*typycha kuratu*), *Phyllanthus niruri* (*para para'i*), *Setaria* sp., *Hymenachne amplexicaule* (camalotillo), *Sida cordifolia* (malva blanca), *Polygonum* sp. (*ka'a tai*), *Aeschynomene* sp., *Eupatorium* sp.3.

En lugares con topografía más elevada, aparecen *Sapium haematospermum* (*kurupika'y*), *Cecropia pachystachya* (*amba'y*), *Sorocea sprucei* ssp. *saxicola* (Maria molle), *Tocoyena formosa*, *Acrocomia aculeata* (*mbokaja*), *Vitex cymosa* (*taruma*), *Ocotea diospyrifolia* (Laurel *sa'yju*), *Bromelia balansae* (*karaguata*).

PALM WAX COPERNICIA ALBA FLOODABLE SAVANNA



Savana inundable de *Copernicia alba* en San Liberato (Lidia Pérez de Molas)

Formación que se caracteriza por estar sometida a inundaciones, quemas periódicas y pastoreo extensivo. La especie dominante en el estrato superior es *Copernicia alba* (*karanda'y*), acompañada de individuos muy aislados de *Acrocomia aculeata* (Mbokaja), *Machaerium hirtum*, *Peltophorum dubium* (*yvyra pytä*), *Copaifera langsdorfii* (*kupa'y*), *Terminalia triflora* (*guajayvi sa'yju*), *Sapium haematospermum* (*kurupika'y*), *Zanthoxylum hirtum* ssp. *hassleri* (*tembetary*), *Cereus stenogonus* (Tuna), *Tocoyena formosa*. En algunos sectores se observó poblaciones puras de *Talisia angustifolia*, *Bromelia balansae* (*karaguata*), *Syagrus campylospatha* (*jata'i mi*), *Annona nutans* (*aratiku*), *Thaumatococcus undulatum* (*guembe*) y *Annona dioica* (*aratiku*),

El estrato herbáceo es continuo y dominado por varias especies de la familia Poaceae, entre ellas *Aristida* sp., en particular se observó la presencia de varias especies de *Arachis* spp.

Relevos:

PO1G Coordenadas: 22° 39' 00''S 56° 54' 35,5'' W, Altitud 148 msnm
 EM4S Coordenadas: 22° 38' 31,8''S 57° 11' 45,4'' W, Altitud 231 msnm
 EM1G Coordenadas: 22° 40' 15''S 56° 54' 00,0'' W, Altitud 138 msnm
 PO2T Coordenadas: 22° 43' 54,7''S 56° 54' 3,0'' W, Altitud 153 msnm
 PO3L Coordenadas: 22° 38' 28,2''S 56° 53' 36,8'' W, Altitud 158 msnm

HIGH SAVANNA (ESPARTILLAR) (UNFLOODABLE)

High savanna in San Liberato (L. Pérez de Molas)

Savana no inundable con dominancia de *Elionurus muticus* (espartillo), formando grandes matas, acompañada por *Aristida* sp., y ejemplares aislados de *Attalea phalerata* (guacuri), *Aspidosperma tomentosum* (kirandy del cerrado), *Butia* sp., *Annona dioica* (aratiku), *Pouteria* sp., *Talisia angustifolia*, *Sapium haemathospermum* (kurupika'y), *Syagrus campylospatha* (jata'i mi), *Melochia villosa*, *Arachis* spp., *Croton* sp.1.

En algunos sitios se observan pequeñas islas de *Acrocomia aculeata* (mbokaja), *Ocotea diospyrifolia* (Laurel sa'yju), *Sapium haemathospermum* (kurupika'y), *Cereus stenogonus* (tuna), *Enterolobium timbouva* (timbo), *Cecropia pachystachya* (amba'y), *Tocoyena formosa*. Los bordes están colonizados por *Bromelia balansae* (karaguata).

Se desarrolla sobre suelos arenosos y con topografía más elevada. Presenta rastros de quema.

Relevo:

PO2L Coordenadas: 22° 38' 57,8''S 56° 52' 28,6'' W, Altitud 177 msnm

DEGRADED HIGH FOREST (BA)



Degraded High Forest. Santa Teresa. 26.03.2021. Lidia Pérez de Molas.

Es un bosque semicaducifolio con una altura de 22-25 m, presenta tres estratos, **Estrato superior:** *Myroxylon peruiferum* (inciense colorado), *Peltophorum dubium* (yvyra pyta), Myrtaceae (Arraijan), *Guibourtia hymenaefolia* (kuruñai), *Anadenanthera colubrina* var. *cebil* (kurupa'y kuru), *Balfourodendron riedelianum* (guatambu), *Sideroxylon obtusifolium* (guajayvi rai), *Ceiba* sp. (samu'u), *Enterolobium timbouva* (timbo), *Myracrodruon urundeuva* (urunde'y mi), *Handroanthus impetiginosus* (lapacho rosado) **Estrato medio:** *Holocalyx balansae* (yvyra pepe), *Calycophyllum multiflorum* (palo blanco), *Maclura tinctoria* ssp. *tinctoria* (tata jyva) *Parapiptadenia rigida* (kurupa'y rä), *Guazuma ulmifolia* (kamba akã), *Casearia gossypiosperma* (mbavy guasu), *Averrhoidium paraguayense*, *Chrysophyllum gonocarpum* (aguai), *Pterogyne nitens* (yvyra ro), *Myrcianthes pungens* (guaviju), *Agonandra brasiliensis*, *Syagrus oleracea* (guaviroba), *Neea* sp., *Samanea tubulosa* (manduvira), *Helietta apiculata* (yvyra ovi), *Myrciaria cuspidata* (typycha ka'aguy), *Attalea phalerata* (guacuri), **Estrato inferior:** se destaca la dominancia de *Gymnanthes discolor*, acompañada por *Trichilia catigua* (katigua pyta), *Trichillia pallida* (katigua moroti), *Adelia membranifolia*, *Allophylus pauciflorus* (koku), entre otros.

El **sotobosque** es ralo con abundantes lianas, principalmente *Pisonia aculeata* (jagua pinda), *Semialarium paniculatum* y varias especies de Bignoniaceae, algunas epifitas como *Thaumatococcus undulatum* (guembe), *Peperomia aceroana*; herbáceas y leñosas terrestres como *Pharus lappulaceus* (ka'i arro), *Pteris denticulata*, *Doriopteris* sp., *Dioscorea* sp., *Pseudananas sagenarius* (yvira), *Randia* sp., *Trichilia elegans* (katigua'i) y *Clavija nutans* (tumby rasy pohá).

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Aunque la regeneración natural se presenta escasa, está presente, algunas de ellas son: *Holocalyx balansae* (yvyra pepe), *Chrysophyllum gonocarpum* (aguai), *Sweetia fruticosa* (taperyva guasu) y *Helietta apiculata* (yvyra ovi).

Ocupa las porciones más altas del terreno, en formaciones discontinuas de variable extensión, alternando con grandes superficies de sabanas altas e inundables. El suelo es arenoso, rojo, cubierto por abundante hojarasca. En algunos sitios aparecen afloramientos rocosos.

Se observó la presencia de grandes hormigueros y algunas madrigueras de fauna. Además algunos tocones de grandes árboles cosechados y vías de saca ya en desuso.

Relevos

EM 1 ST	Coordenadas:	22°36'17.6"S	56°33'30.0"W,	Altitud	189 msnm
EM 2 ST	Coordenadas:	22°36'16.8"S	56°33'37.3"W,	Altitud	215 msnm
PO 1 ST	Coordenadas:	22°36'20.1"S	56°33'14.8"W,	Altitud	185 msnm
PO 2 H	Coordenadas:	22°28'4.2"S	56°58'6.9"W,	Altitud	218 msnm

RIPARIAN OR MARGINAL FOREST (BR)



Riparian Forest or marginal foresto n Napegue Stream and bordering a flooded savanna. Santa Teresa. 26.03.2021. Lidia Pérez de Molas.



Dry waterbed of Negla'i stream. Zapallo. 29.03.2021. Lidia Pérez de Molas.

Se desarrolla generalmente en ambas márgenes de un curso de agua. Es un bosque de unos 18-20 metros de altura, con tres estratos. **Estrato superior:** *Anadenanthera colubrina* var. *cebil* (kurupa'y kuru), *Copaifera langsdorfii* (Kupa'y), *Handroanthus ochraceus* (tajy sa'yju), *Peltophorum dubium* (yvyra pyta), *Inga uraguensis* (inga gusu), *Myracrodruon urundeuva* (urunde'y mi), *Sweetia fruticosa* (Taperyva guasu), *Aspidosperma pyrifolium* (palo rosa), *Guibourtia hymenaefolia* (kuruñai), *Schefflera morototoni* (amba'y guasu), *Nectandra* aff. *cissiflora* (laurel ne), *Pseudobombax tomentosum* (mandyju ra), *Enterolobium timbouva* (timbo), **Estrato medio:** *Chrysophyllum gonocarpum* (Aguai), *Tapirira guianensis* (ka'a mbota), *Averrhoidium paraguayense*, Myrtaceae, *Salacia elliptica* (pakuri brasilerero), *Casearia gossypiosperma* (mbavy guasu), *Syagrus romanzoffiana* (pindo), *Attalea phalerata* (guacuri), *Protium heptaphyllum* (Yvyra ysy), *Campomanesia xanthocarpa* (guavira pyta), **Estrato inferior:** *Genipa americana* (ñandypa guasu), *Cecropia pachystachya* (amba'y), *Neea* sp., *Guarea macrophylla* ssp. *spiciflora* (cedrillo), *Helietta apiculata* (yvyra ovi), *Citrus aurantium* (apepu), Myrtaceae, *Coussarea platyphylla*, *Casearia sylvestris*

(burro ka'a), *Gymnanthes discolor*, *Croton urucurana* (sangre de drago), *Garcinia brasiliensis* (pakuri), *Trichilia catigua* (catigua pyta), *Trichillia pallida* (katigua moroti) y *Helicteres Ihotzkyana*.

En riberas de los Arroyos Trementina y Hermosa se han registrado la presencia de tacuarales de *Guadua chacoensis* (takuara) de más de 15 metros de altura.

El sotobosque es ralo. Las especies presentes son *Clavija nutans* (tumby rasy poha), *Trichilia elegans* (katigua'i), *Xylosma venosa* (ñuati pyta), *Psychotria carthagenensis*, *Randia* spp. (ñuati kurusu), Epífitas como *Taumatococcus undulatum* (guembe), *Microgramma persicariifolia*, *Phlebodium decumanum* (calaguala), terrestres como *Geophila repens*, *Dorstenia cayapia* ssp. *paraguariensis* (tarope) y *Oeceoclades maculata* (orquídea burrito). Algunas lianas son *Pisonia aculeata* (jagua pinda), *Cissus erosa* (parral saite), *Smilax* sp., *Cardiospermum grandiflorum* (ysypo kamambu) y *Paullinia pinnata*. Se destaca el hallazgo de *Lophophytum mirabile* (yvoty yvy), una parásita radicular registrada en el bosque ribereño del arroyo Negla. El suelo es arenoso y cubierto por abundante hojarasca. El barranco es casi vertical de unos 3 a 4 m de altura. El Arroyo Negla'i se encontraba con el cauce totalmente seco.

Se registró además la presencia de grandes árboles cortados y abandonados en el bosque de antigua data, además de tocones. Igualmente, en el Bosque Ribereño del Arroyo Hermosa se registraron signos de aprovechamiento.

Relevos

PO 2 ST	Ao. Napegue	Coordenadas:	22°36'31.8"S	56°33'08.8"W	Altitud	166 msnm
EM 3 ST	Ao. Napegue	Coordenadas:	22°36'32.0"S	56°33'08.0"W	Altitud	174 msnm
PO 1 Z	Ao. Negla'i	Coordenadas:	22°24'37.3"S	56°32'21.4"W	Altitud	191 msnm
PO 1 H	Ao. Hermosa	Coordenadas:	22°31'08.2"S	56°56'28.8"W	Altitud	186 msnm
PO 6 H	Ao. Trementina	Coordenadas:	22° 24' 45,1S"	56°55' 32,2"W	Altitud	184 msnm
EM 5 H	Ao. Trementina	Coordenadas:	22°31'17.4"S	56°56'52.4"W	Altitud	186 msnm

CERRADÓN (CD)

Cerradón. Zapallo. 30.03.2021. Lidia Pérez de Molas.

Se encuentran ocupando isletas de gran tamaño. Bosque semicaducifolio abierto, alcanza una altura de 15-18 metros, presenta tres estratos: **Estrato superior:** *Astronium fraxinifolium* var. *glabrum* (urunde'y para moroti), *Handroanthus impetiginosus* (lapacho rosado), *Schefflera morototoni* (amba'y guasu), *Peltophorum dubium* (yvyra pyta), *Cordia americana* (guajayvi), *Magonia pubescens* (yvyra hy'a), *Myracrodruon urundeuva* (urunde'y mi), *Priogymnanthus hasslerianus* (ka'a vera), *Sterculia striata*, *Entolobium timbouva* (timbo), *Cordia glabrata* (peterevy moroti), *Platypodium elegans*, **Estrato medio:** *Salacia elliptica* (pakuri brasileiro), *Chrysophyllum gonocarpum* (Aguai), *Samanea tubulosa* (manduvira), *Agonandra brasiliensis*, *Dipterys alata*, *Combretum leprosum*, *Tapirira guianensis* (Ka'a mbota), *Acosmium subelegans*, *Protium heptaphyllum* (yvyra ysy), *Terminalia argentea* (capitán), *Guazuma ulmifolia* (kamba aka), *Inga uraguensis* (inga guasu), *Attalea phalerata* (guacuri), *Casearia gossypiosperma* (mbavy guasu), *Ocotea diospyrifolia* (aju'y sa'yju), *Syagrus romanzoffiana* (pindo), *Aspidosperma tomentosum* (kirandy del cerrado), *Acrocomia aculeata* (mbocaja), *Guettarda viburnoides*, *Tabebuia aurea* (paratodo), *Averrhoidium paraguayense*, **Estrato inferior:** *Casearia sylvestris* (burro ka'a), *Acrocomia aculeata* (mbokaja), *Genipa americana* (ñandypa guasu), *Tabebuia roseo-alba* (tajy moroti), *Trichilia pallens* (Katigua), *Annona neosalicifolia* (aratiku), *Helicteres lhotzkyana*, *Machaerium acutifolium*.

El sotobosque es ralo, algunas especies presentes son: *Bredemeyera floribunda*, *Trichilia stellato-tomentosa*, *Tocoyena formosa*, *Trichilia elegans* (catigua'i), *Rhamnidium elaeocarpum* (taruma'i), *Randia* spp. (ñuati kurusu), entre otros.

El suelo es arenoso cubierto por abundante hojarasca.

Se observaron madrigueras de fauna y algunos tocones de aprovechamiento de antigua data.

Relevos

PO 3 Z Coordenadas: 22° 30' 21,0" S 56° 31' 4,3" W Altitud 183 msnm

PO 4 Z Coordenadas: 22°31'59,4" S 56°36'15,1" W Altitud 183 msnm

CERRADO FIELD OR "CAMPO CERRADO" (CC)



Cerrado Field in a pastureland of *Urochloa brizantha*.
Hermosa. 4.4.2021. (L. Pérez de Molas)

Cerrado Field. Hermosa. 4.4.2021
(Lidia Pérez de Molas)

Es una formación sabánica caracterizada por la predominancia de especies arbustivas y subarbustivas con importantes sistemas radiculares de perduración como los xilopodios. Se desarrollan generalmente sobre suelos arenosos y están sometidos a quemas periódicas. Las especies herbáceas también están presentes, aunque en menor proporción.

Algunas especies características son: *Campomanesia adamantium* (guavira mi), *Croton campestris*, *Duguetia furfuracea* (aratiku), *Orthopapus angustifolius*, *Vernonantura chamaedrys* (typycha moroti), *Anacardium humile* (kaju'i), *Talisia angustifolia*, *Eryngium ebracteatum*, *Schinus weinmanniifolius*, *Sida linifolia*, *Spermacoce verticillata* (typycha corredor), *Croton glandulosus*, *Mandevilla petraea*, *Oxalis renifolia*, *Annona dioica* (aratiku), *Ayenia tomentosa*, *Arachis* sp., *Desmodium barbatum* (taha taha), *Orthopapus angustifolius*, *Mimosa xanthocentra* (jukeri), *M. debilis*, *Microstachys hispida*, *Calliandra brevicaulis*, *Turnera grandiflora*, *Psidium* spp., *Allagoptera* sp., *Butia* sp., *Waltheria* sp., *Melochia* sp., *Schizachyrium* sp., *Lygodium venustum*, *L. volubile*, *Indigofera* sp., *Rhynchosia* sp., *Zornia* spp., *Indigofera elegans*, *Ximenia intermedia*, *Pterocaulon* spp., *Evolvulus sericeus*, *Aeschynomene* spp., *Adiantum serrato-dentatum*, *Riedeliella graciliflora*, *Cnidoscopus albomaculatus* y *Synedrellopsis grisebachii*.

La formación se encuentra en estado degradado, ya que en la actualidad es una pastura de *Urochloa brizantha*, en Hermosa, sometida al sobre-pastoreo. Las especies del cerrado que se han registrado en esta pastura indican que la vegetación original ha sido ésta. Otras características que suman a la degradación es la presencia de mucho suelo desnudo, una red de senderos muy erosionados y compactados, rastros de quemas periódicas, abundantes heces de ganado y grandes hormigueros. Se registró además algunas madrigueras activas de fauna.

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Biodiversity Baseline Study of Parcel Properties. Parcel S.A.
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Relevos

EM 3 H Coordenadas: 22°31'13.6"S 56°56'44.0"W, Altitud 171 msnm
 EM 4 H Coordenadas: 22°27'13.3"S 56°54'58.5"W, Altitud 215 msnm

DIRTY FIELD OR “CAMPO SUCIO” (CS)

Dirty field or “Campo sucio”. Zapallo. 31.03.2021. Lidia Pérez de Molas.

La fitofisionomía corresponde a una sabana caracterizada por la presencia de subleñosas y herbáceas, principalmente, especies de Poaceae, Asteraceae, Euphorbiaceae, Fabaceae. Las Poaceae cubren gran parte de la superficie del suelo, con sus grandes matas. Algunas especies presentes son *Talisia angustifolia*, *Mandevilla petraea*, *Mimosa debilis* (jukeri), *Spermacoce verticillata* (typycha corredor) *Andropogon lateralis* (kapi'i pyta), *Sida linifolia*, *Pfaffia* sp., *Desmodium barbatum* (taha taha), *Croton glandulosus*, *Microstachys hispida*, *Aeschynomene elegans*, *Oedochloa procurrans*, *Solanum viarum* (mboi rembi'u), *Arachis* sp., *Aristida* sp., *Adiantum serrato-dentatum*, *Ruellia* sp. , *Annona dioica* (aratiku), *Hyptis* spp.,

Se desarrolla en partes altas del terreno, con suave pendiente, en él alternan las isletas de diferente tamaño y biodiversidad. Algunas especies presentes en las isletas son: *Cordia glabrata* (peterevy moroti), *Machaerium hirtum*, *Sapium haematospermum* (kurupika'y), *Acosmium subelegans*, *Acrocomia aculeata* (mbokaja), *Tapirira guianensis* (camboata), *Handroanthus heptaphyllus* (Tajy hu), *Annona nutans* (aratiku ñu). En los bordes de las isletas se encuentran *Bromelia balansae* (karaguata) y *Syagrus campylospatha* (jata'i mi).

Relevo

EM 4 Z Coordenadas: 22°31'18.5" S 56°36'35.5" W Altitud 163 msnm

SABANA ALTA (SA)



High savanna ("espartillar" grasslands). Zapallo.
29.03.2021. Lidia Pérez de Molas.

High savanna. Santa Teresa. 27.03.2021.
Lidia Pérez de Molas.

Formación caracterizada por un estrato herbáceo con predominancia de Poaceae con matas grandes, herbáceas y subleñosas, alternando con árboles aislados de *Acrocomia aculeata* (mbokaja), *Machaerium hirtum*, formando pequeños grupos, *Salacia elliptica* (pakuri brasileiro) y arbustos como *Tocoyena formosa*. Así mismo la fitofisionomía incluye isletas de diferente tamaño y biodiversidad.

Especies características: *Elionurus muticus* (espartillo), *Hyptis* spp., *Arachis* spp., *Eupatorium* sp., *Melochia* aff. *pilosa*, *Adiantum serrato-dentatum*, *Lygodium volubile*, *Rhynchospora nervosa*, *Mimosa xanthocentra* (jukeri), *Aeschynomene elegans*, *Chamaecrista* aff. *nictitans*, *Scleria distans*, *Crotalaria maypurensis*, *sauvagesia erecta*, *Pterocaulon alopecuroides*, *Buchnera longifolia*, *Microstachys hispida*, *Zornia* sp., *Bauhinia* sp., *Croton campestris*, *C. andinus*, *Sida linifolia*, *Mimosa debilis* (jukeri), *Chamaecrista flexuosa*, *Mandevilla petraea*, *Schizachirium* sp., *Andropogon selleanus*, *Aristida* sp., *Oedochloa procurrans*, *Lippia* aff. *turnerifolia* var. *turnerifolia*, *Evolvulus sericeus*, *Mimosa dolens* (jukeri), *Polygala linoides*, *Desmodium barbatum* (taha taha), *Stachytarpheta cayennensis* (tatu ruguai), *Acisanthera alsinaefolia*, *Oxalis renifolia*, *Malvastrum coromandelianum*, *Andropogon lateralis* (kapi'i pyta), *Paspalum* spp., *Croton glandulosus*, *Spermacoce verticillata* (typycha corredor).

Las especies de *Pterocaulon lanatum* y *Sidastrum paniculatum*, *Solanum granuloso-leprosum* (hu'i moneha) son las dominantes como invasoras en las pasturas sobrepastoreadas y degradadas.

Las isletas presentan una altura de 5 hasta 8 metros, con estrato arbóreo, arbustivo y herbáceo. Las especies presentes son: *Sapium haematospermum* (kurupika'y), *Ocotea diospyrifolia* (aju'y sa'yju), *Zanthoxylum rigidum* ssp. *hasslerianum* (tembetary), *Casearia sylvestris* (burro ka'a), *Chrysophyllum marginatum* (pykasu rembi'u), Myrtaceae, *Handroanthus impetiginosus* (Lapacho rosado), *Genipa americana* (ñandypa guasu), *Handroanthus ochraceus* (tajy sa'yju), *Astronium fraxinifolium* var. *glabrum* (urunde'y para moroti), *Tocoyena formosa*, *Xylosma venosa* (ñuati pyta), *Psidium* spp. (arasa mbaja), *Chomelia obtusa*, *Varronia* sp., *Randia* spp. (ñuati kurusu). Las lianas y arbustos apoyantes presentes son: *Paullinia pinnata* y *Aegiphilla verticillata*. Los bordes se encuentran colonizados por *Bromelia balansae* (karaguata).

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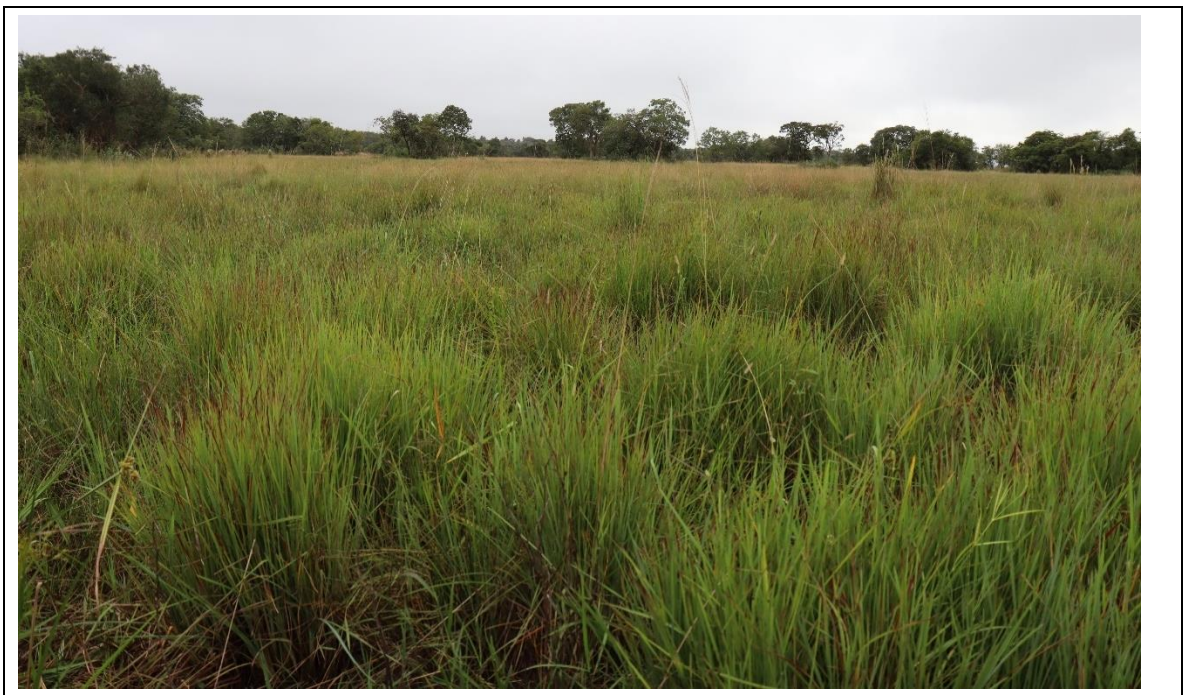
Ocupan los lugares más altos del terreno. El suelo es arenoso o arcilloso y muy seco. Existen rastros de quemas, senderos y heces de ganado.

El potrero con pastura de *Urochloa brizantha*, presenta una alta densidad de ejemplares adultos y regeneración natural de *Attalea phalerata* (guacuri), individuos aislados de *Sapium haematospermum* (kurupika'y), *Anadenanthera colubrina* var. *cebil* (kurupa'y kuru), *Helieta apiculata* (yvyra ovi), *Machaerium aculeatum* (yvyra tanimbú), *Luehea divaricata* (ka'a oveti), *Ficus* sp. (guapo'y), *Lonchocarpus pluvialis*, *Acosmium subelegans*, *Zanthoxylum riedelianum* (tembetary sa'yju), entre otros.

Relevos

PO 3 ST	Coordenadas:	22°36'49.4"S	56°33'25.5"W	Altitud 165 msnm
EM 5 ST	Coordenadas:	22°35'22.0"S	56°33'51.0"W	Altitud 178 msnm
EM 8 ST	Coordenadas:	22°39'25.8"S	56°41'27.3"W	Altitud 163 msnm
EM 1 Z	Coordenadas:	22°25'26.2"S	56°22'48.1"W	Altitud 202 msnm
PO 5 H	Coordenadas:	22°27'03.9"S	56°54'57.2"W	Altitud 215 msnm
EM 2 H	Coordenadas:	22°24'35.6"S	56°55'04.8"W	Altitud 221 msnm

FLOODABLE SAVANNA WITH FOREST ISLANDS (SI)



Flooded savanna. Santa Teresa. 28.03.2021. Lidia Pérez de Molas.

Se caracteriza por presentar un estrato herbáceo dominante formado principalmente por especies de Poaceae y Cyperaceae creciendo en grandes matas y muchas veces alcanzando una altura de más de 1 metro. Las especies características son: *Cyperus giganteus* (piri guasu), *Paspalum intermedium*, *Aeschynomene* aff. *americana*, *A. elegans*, *Pontederia cordata* (kamalote), *Byttneria* sp., *Vernonantura brasiliana*, *Commelina diffusa* (santa lucia hovy), *Acalypha* sp., *Ludwigia nervosa*, *L. filiformis*, *L. hassleriana*, *L. sericea*, *Cuphea lysimachioides* (ysypo pere), *Rhynchospora* spp., *Hetropterys glabra*, *Melochia parvifolia*, *Acisanthera alsinaefolia*, *Tibouchina* sp., *Schultesia* sp., *Nymphoides indica*,

Echinodorus sp., *Sauvagesia erecta*, *Angelonia integerrima*, *A. salicariifolia*, *Polygala linoides* var. *linoides*, *P. molluginifolia*, *Lippia* aff. *turnerifolia* var. *turnerifolia*, *Stemodia* spp., *Corchorus argutus*, *Cipura paludosa* ssp. *boliviensis*, *Cantinoa althaeifolia*, *Hydrolea elatior*, *Caperonia* aff. *castaneifolia*, *C. palustris*, *Lessingianthus rubricaulis*, *Campuloclinium macrocephalum*, *Eryngium ebracteatum*, *Justicia laevilinguis*, *Schizachyrium* spp., *Eleocharis* spp., *Polygonum* spp. Entre las lianas se destacan *Mikania* sp. y *Rhabdadenia ragonesei*.

Ocupan las zonas de altitud intermedia entre la sabana alta y la sabana inundada. El suelo es arcilloso, oscuro, con abundante materia orgánica, y sufren inundaciones (septiembre a noviembre) y quemadas periódicas principalmente en el otoño-invierno.

En las áreas más bajas, y con agua permanente, aparecen poblaciones casi puras de *Thaumatococcus undulatum* (guembe) y especies de Poaceae (Kapi'i pe'y) y Cyperaceae, como *Cyperus giganteus* (piri guasu). En algunos sitios se presentan ejemplares aislados de *Sesbania exasperata*, *Machaonia brasiliensis* y *Helicteres gardneriana*.

Estas áreas también representan a los potreros con pasturas implantadas de *Urochloa humidicola*.

Presenta evidencias de degradación como huellas profundas, senderos muy erosionados y heces de ganado. Son potreros de cría, con carga permanente.

Alternando con la sabana inundable y en lugares más altos, casi siempre con presencia de uno a tres hormigueros con sus respectivas madrigueras, se encuentran las isletas, con forma, tamaño y biodiversidad variable, caracterizada por elementos florísticos de los cerradones como *Dipteryx alata*, *Dilodendron bipinatum*, *Xylopia brasiliensis*, *Acrocomia aculeata* (mbokaja), *Sapium haematospermum* (kurupika'y), *Acosmium subelegans*, *Guibourtia hymenaeifolia* (kuruñai), *Handroanthus impetiginosus* (lapacho rosado), *Sorocea sprucei* (maria molle), *Copaifera langsdorfii* (kupa'y), *Machaerium hirtum*, *Astronium fraxinifolium* var. *glabrum* (urunde'y para moroti), *Anadenanthera peregrina* (kurupa'y ita), *Aspidosperma quebracho-blanco* (quebracho blanco), *Sideroxylon obtusifolium* (guajayvi rai), *Ocotea diospyrifolia* (aju'y sa'yju), *Cereus stenogonus* (tuna). Los arbolitos y arbustos presentes son *Randia* spp. (ñuati kurusu), *Myrsine* sp. (kanelón), *Genipa americana* (ñandypa guasu), *Monteverdia ilicifolia* (kangorosa), *Casearia sylvestris* (burro ka'a), *Tabernaemontana catharinensis* (sapiranguy), *Tocoyena formosa*, *Psidium* spp., *Cestrum* sp., *Trichilia stellato-tomentosa*, *Celtis* sp. (juasy'y), *Xylosma venosa* (ñuati pyta), *Melochia* sp., *Scleria* sp. Entre las lianas se citan a *Forsteronia glabrescens* y *F. pubescens* (ysypo kamby), *Paullinia pinnata*, *Smilax* sp., *Tanaecium* sp., *Bonamia* aff. *subsessilis*, *Janusia guaranitica*, *Smilax* sp., *Passiflora cincinnata* (mburucuja), entre otros. Los bordes generalmente se encuentran colonizados por *Bromelia balansae* (karaguata) y *Stachytarpheta cayennensis* (tatu ruguai).

Relevos

EM 4 ST	Coordenadas:	22°36'29.2" S	56°33'14.6" W	Altitud 166 msnm
EM 6 ST	Coordenadas:	22°38'27.9" S	56°39'00.8" W	Altitud 172 msnm
EM 7 ST	Coordenadas:	22°39'39.8" S	56°37'48.0" W	Altitud 168 msnm
EM 2 Z	Coordenadas:	22°31'33.5" S	56°32'32.6" W	Altitud 187 msnm
EM 1 H	Coordenadas:	22°28'02.1" S	56°57'41.8" W	Altitud 218 msnm
PO 3 H	Coordenadas:	22°27'39.5" S	56°57'29.7" W	Altitud 216 msnm
PO 7 H	Coordenadas:	22°24'55.8" S	56°53'52.8" W	Altitud 187 msnm

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May 2021.

FLOODED SAVANNA WITH “EMBALSADO” (Sin)



Flooded savanna with “embalsado”. Zapallo. 30.03.2021. Lidia Pérez de Molas.

Constituye un gran humedal caracterizado por la dominancia de pocas especies, entre ellas Cyperaceae y Fabaceae, principalmente *Aeschynomene* aff. *americana* creciendo en forma aislada. Tiene agua permanente y un sustrato orgánico que produce movimiento al caminar encima. Algunas especies registradas además son: *Eleocharis* spp.; *Utricularia* spp., *Hibiscus sororius*, *Ludwigia nervosa*, *Nymphoides indica*, *Pontederia* aff. *subovata*.

EMBALSADO

Embalsado en Sabana Inundada. Zapallo. 30.03.2021. Lidia Pérez de Molas.

Insertos en algunos pocos sectores se encuentran embalsados de unos 10 hasta 15 metros de diámetro, colonizados principalmente por leñosas de las familias Onagraceae, Fabaceae y Malvaceae. Algunas especies registradas son *Habenaria* aff. *repens*, *Mayaca sellowiana*, *Myrsine* sp., *Cecropia pachystachya* (amba'y), *Bacopa* aff. *salzmannii*, Pteridophyta, Melastomataceae, *Xyris* sp., *Hydrolea* aff. *spinosa* var. *paraguayensis*.

Relevo

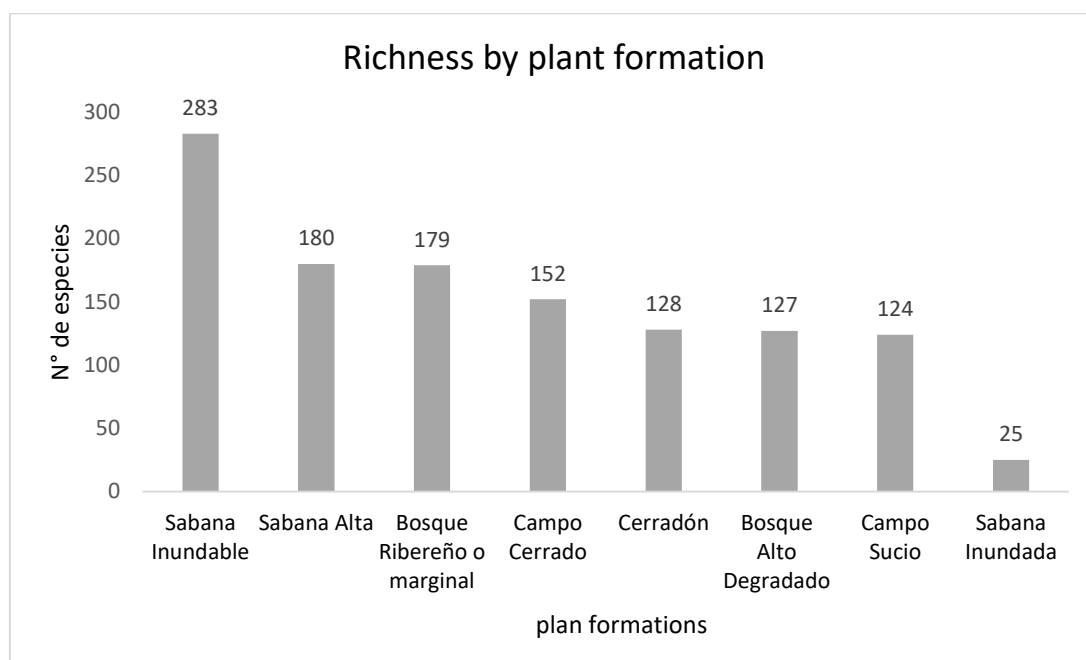
PO2 Z Coordenadas: 22°30'24.5" S 56°30'58.2" W Altitud 211 msnm

AQUATIC VEGETATION IN WATER BODIES

Laguna. Zapallo. 29.03.2021. Lidia Pérez de Molas.

En los cuerpos de agua de variable dimensión y profundidad, y dispersos en todos los sitios de estudio, establecidos para consumo del ganado principalmente, se desarrolla la vegetación acuática-palustre, entre las que se citan a las anfibias, enraizadas en el fondo y las flotantes libres. Algunas especies registradas son: *Eleocharis* spp., *Pontederia azurea* (aguape), *Nymphoides indica*, *Limnocharis flava*, *Hydrocleys nymphoides*, *Ludwigia nervosa*, *Gymnocoronis spilantoides*, *Marsilea* sp.. En los bordes se desarrollan poblaciones casi puras de *Polygonum* spp., entre otros.

Richness of vascular flora for plant formations



List of species with known uses

N°	Species and author	Common name in Spanish or Guarani	Uses
1	<i>Monvillea cavendishii</i> (Monv.) Britton & Rose	Cola de León	Co
2	<i>Garcinia brasiliensis</i> Mart.	Pakuri	Co
3	<i>Erythroxylum cuneifolium</i> (Mart.) O.E. Schulz	Coca del Campo	Co
4	<i>Anacardium humile</i> A. St.-Hil.	kaju'i	Co, Fo, Or
5	<i>Pseudananas sagenarius</i> (Arruda) Camargo	yvira, Kunto purâ	Co, In
6	<i>Cnidocolus albomaculatus</i> (Pax) I.M. Johnst.	Ortiga	Co, Me
7	<i>Campomanesia adamantium</i> (Cambess.) O. Berg	Guavira mi	Co, Me, Mel
8	<i>Sideroxylon obtusifolium</i> (Roem. & Schult.) T.D. Penn.	guajayvi rai	Com, Co
9	<i>Syagrus campylospatha</i> (Barb. Rodr.) Becc.	yatay mi	Fo
10	<i>Syagrus oleracea</i> (Mart.) Becc.	guaviroba	Fo
11	<i>Erythroxylum suberosum</i> A. St.-Hil.		Fo
12	<i>Ficus</i> sp.2	guapo'y	Fo
13	<i>Ficus</i> sp.3	guapo'y	Fo
14	<i>Annona nutans</i> (R.E. Fr.) R.E. Fr.	Aratiku ñu	Fo, Co
15	<i>Annona dioica</i> A. St.-Hil.	Aratiku ñu	Fo, Co, Me
16	<i>Annona emarginata</i> (Schltdl.) H. Rainer	Aratiku'i	Fo, Co, Or
17	<i>Andropogon bicornis</i> L.	Aguara Ruguai, Cola de Zorro	Fo, In, Co
18	<i>Didymopanax morototoni</i> (Aubl.) Decne. & Planch.	Amba'y guasu	Fo, Ind
19	<i>Sorocea sprucei</i> (Baill.) J.F. Macbr. ssp. <i>saxicola</i> (Hassl.) C.C. Berg	María molle	Fo, MC
20	<i>Nectandra</i> aff. <i>cissiflora</i> Nees	laurel ne	Fo, MC, Or
21	<i>Psidium</i> sp.2	Arasa	Fo, Me, Mel
22	<i>Syagrus romanzoffiana</i> (Cham.) Glassman	pindo	Fo, Mel, Me
23	<i>Chrysophyllum marginatum</i> (Hook. & Arn.) Radlk.	Pykasu rembi'u	Fo, Or, In
24	<i>Curatella americana</i> L.		Fo, Or, Me, Com, Mel

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N°	Species and author	Common name in Spanish or Guarani	Uses
25	<i>Trichilia catigua</i> A. Juss.	katigua pytã	Fo, Or, Mel
26	<i>Forsteronia glabrescens</i> Müll. Arg.	ysypo kamby	In, Mel, MC
27	<i>Pseudobombax tomentosum</i> (Mart. & Zucc.) A. Robyns	Mandyju ra	Ind
28	<i>Cordia glabrata</i> A. DC.	Peterevy moroti	Ind, MC, Or
29	<i>Enterolobium timbouva</i> Mart.	Timbo	Ind, MC, Or, Fo
30	<i>Enterolobium contortisiliquum</i> (Vell.) Morong	Timbo	Ind, MC, Or, Fo, Mel
31	<i>Cordia trichotoma</i> (Vell.) Arráb. ex Steud.	Peterevy hu	Ind, MC, Or, Mel
32	<i>Trichilia pallens</i> C. DC.	Katigua moroti	Ind, Or
33	<i>Albizia niopoides</i> (Spruce ex Benth.) Burkart	Yvyra ju	Ind, Or, Mel
34	<i>Terminalia triflora</i> (Griseb.) Lillo	Guajayvi sa'yju	Ind., Or, MC, Mel
35	<i>Vitex cymosa</i> Bertero ex Spreng.	Taruma	MC, Co, Fo, Me, Or
36	<i>Dimorphandra mollis</i> Benth.	Lorito pysa	MC, Fo, Me, Co, Ind
37	<i>Trichilia clausenii</i> C. DC.	Katigua guasu	MC, Fo, Or
38	<i>Guazuma ulmifolia</i> Lam.	Kamba aka	MC, Ind, Com, Ind, Or, Fo, Mel
39	<i>Parapiptadenia rigida</i> (Benth.) Brenan	Kurupa'y ra	MC, Ind, Com, Mel, Or
40	<i>Ocotea minarum</i> (Nees & Mart. ex Nees) Mez		MC, Ind, Fo
41	<i>Trichilia pallida</i> Sw.	Katigua moroti	MC, Ind, Fo
42	<i>Ocotea diospyrifolia</i> (Meisn.) Mez	Laurel sa'yju	MC, Ind, Fo, Mel
43	<i>Sterculia striata</i> A. St.-Hil. & Naudin		MC, Ind, Fo, Or
44	<i>Myrocarpus frondosus</i> Allemão [®]	Inciense	MC, Ind, Mel, Me, Or
45	<i>Holocalyx balansae</i> Micheli	Yvyra pepe	MC, Ind, Or, Fo
46	<i>Handroanthus impetiginosus</i> (Mart. ex DC.) Mattos	Lapacho rosado	MC, Ind, Or, Mel
47	<i>Cordia americana</i> (L.) Gottschling & J.S. Mill.	Guajayvi	MC, Ind, Or, Mel
48	<i>Pterogyne nitens</i> Tul.	Yvyraro	MC, Ind, Orn, Mel
49	<i>Copaifera langsdorffii</i> Desf.	Kupa'y	MC, Me, Or, Mel, Ind
50	<i>Astronium fraxinifolium</i> Schott var. <i>glabrum</i> Engl.	urunde'y para moroti	MC, Or
51	<i>Aspidosperma cylindrocarpon</i> Müll. Arg.	Palo rosa	MC, Or
52	<i>Aspidosperma pyrifolium</i> C. Mart.	Palo rosa	MC, Or
53	<i>Tabebuia roseo-alba</i> (Ridl.) Sandwith	Lapacho blanco	MC, Or
54	<i>Cyclolobium brasiliense</i> Benth.		MC, Or
55	<i>Amburana cearensis</i> (Allemão) A.C. Sm.	Trébol	MC, Or, Ind
56	<i>Myracrodruon urundeuva</i> Allemão	Urunde'y mi	MC, Or, Mel
57	<i>Tachigali aurea</i> Tul.		MC, Or, Mel, Or, Me
58	<i>Lygodium venustum</i> Sw.		Me
59	<i>Hemionitis tomentosa</i> (Lam.) Raddi	Doradilla	Me
60	<i>Bromelia balansae</i> Mez	Karaguata	Me
61	<i>Scleria distans</i> Poir.	Kapi'i katí estero	Me
62	<i>Andropogon lateralis</i> Nees	kapi'i pytã	Me
63	<i>Elionurus muticus</i> (Spreng.) Kuntze	Espartillo guasu	Me
64	<i>Schinus weinmannifolius</i> Engl.	Molle'i	Me

N°	Species and author	Common name in Spanish or Guarani	Uses
65	<i>Dasyphyllum brasiliense</i> (Spreng.) Cabrera var. <i>brasiliense</i>	Ñurí	Me
66	<i>Pluchea sagittalis</i> (Lam.) Cabrera	yerba de lucero	Me
67	<i>Porophyllum ruderale</i> (Jacq.) Cass.	yryvu retyma	Me
68	<i>Solidago chilensis</i> Meyen	Mbu' y sa' yju	Me
69	<i>Protium heptaphyllum</i> (Aubl.) Marchand	Yvyra ysy	Me
70	<i>Inga affinis</i> DC.	Inga	Me
71	<i>Sidastrum paniculatum</i> (L.) Fryxell	Makagua ka'a	Me
72	<i>Triumfetta semitriloba</i> Jacq.	Amoreseco	Me
73	<i>Dorstenia brasiliensis</i> Lam.	Tarope	Me
74	<i>Pisonia aculeata</i> L.	Jagua pinda	Me
75	<i>Clavija nutans</i> (Vell.) B. Ståhl	jagua ku, tumbly rasy pohä	Me
76	<i>Helietta apiculata</i> Benth.	Yvyra ovi	Me
77	<i>Solanum granulosum-leprosum</i> Dunal	hu'i moneha	Me
78	<i>Solanum palinacanthum</i> Dunal	Tuti'a	Me
79	<i>Solanum paniculatum</i> L.	Juruvéva	Me
80	<i>Cecropia pachystachya</i> Trécul	Amba'y	Me
81	<i>Lippia lupulina</i> Cham.		Me
82	<i>Stachytarpheta cayennensis</i> (Rich.) Vahl	tatu rugu'ai	Me
83	<i>Cissus verticillata</i> (L.) Nicolson & C.E. Jarvis	ka'avurä	Me
84	<i>Aspidosperma quebracho-blanco</i> Schltld.	quebracho blanco	Me
85	<i>Passiflora cincinnata</i> Mast.	Mburukuja	Me, Co
86	<i>Duguetia furfuracea</i> (A. St.-Hil.) Benth. & Hook. f.	Aratiku hata	Me, Fo
87	<i>Qualea grandiflora</i> C. Mart.		Me, Fo, Co, Ind, MC, Mel
88	<i>Xylopiya aromatica</i> (Lam.) C. Mart.	ka'i pimienta	Me, Fo, In
89	<i>Brosimum gaudichaudii</i> Trécul		Me, Fo, Me, Mel
90	<i>Casearia sylvestris</i> Sw.	Burro ka'a	Me, Fo, Mel, MC, Or
91	<i>Inga uraguensis</i> Hook. & Arn.	Inga guasu	Me, Fo, Or, Mel
92	<i>Genipa americana</i> L.	Ñandypa guasu	Me, Fo, Or, Mel
93	<i>Citrus aurantium</i> L.	Apepu, Naranja Hai	Me, Ind, Mel
94	<i>Bauhinia forficata</i> Link ssp. <i>pruinosa</i> (Vogel) Fortunato & Wunderlin	Pata de buey	Me, MC, Com, Or
95	<i>Anadenanthera colubrina</i> (Vell.) Brenan var. <i>cebil</i> (Griseb.) Altschul	Kurupa'y kuru	Me, MC, Ind, Com, Mel, Or
96	<i>Maclura tinctoria</i> (L.) Steud. ssp. <i>tinctoria</i>	Tata jyva	Me, MC, Or, Ind, Co, Mel
97	<i>Peltophorum dubium</i> (Spreng.) Taub.	Yvyra pyta	Me, Mc, Or, Mel
98	<i>Tabernaemontana catharinensis</i> A. DC.	Sapirangy	Me, Mel
99	<i>Handroanthus heptaphyllus</i> (Vell.) Mattos	tajy hu	Me, Mel
100	<i>Sapium haematospermum</i> Müll. Arg.	Kurupika'y	Me, Mel
101	<i>Cuphea lysimachioides</i> Cham. et Schltld.	Ysypo pere	Me, Mel
102	<i>Sida cordifolia</i> L.	Malva blanca	Me, Mel
103	<i>Trichilia elegans</i> A. Juss.	Katigua'i	Me, Mel
104	<i>Eugenia uniflora</i> L.	Ñangapiry	Me, Mel
105	<i>Scoparia dulcis</i> L.	Typycha kuratu	Me, Mel
106	<i>Allophylus edulis</i> (A. St.-Hil., A. Juss. & Cambess.) Hieron. ex Niederl.	Koku	Me, Mel
107	<i>Luehea divaricata</i> Mart.	Ka'a oveti	Me, Mel, Co, Fo,

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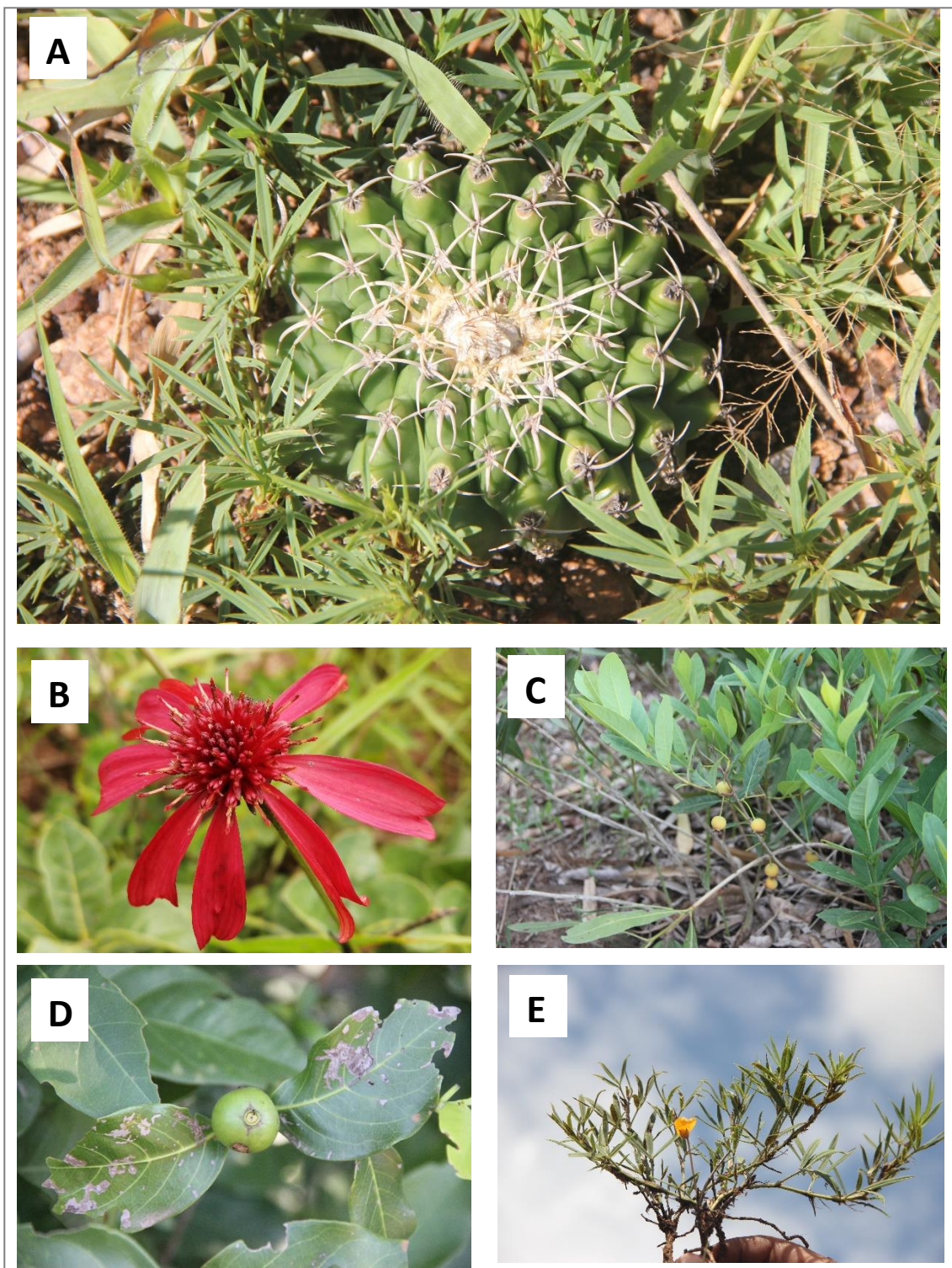
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N°	Species and author	Common name in Spanish or Guaraní	Uses
			MC
108	<i>Croton urucurana</i> Baill.	Sangre de Drago, Sangre de Grado, Uruku Râ, Pyuchu	Me, Mel, Com
109	<i>Plenckia populnea</i> Reissek		Me, Or, MC
110	<i>Handroanthus ochraceus</i> (Cham.) Mattos ssp. <i>ochraceus</i>	Tajy sa'y ju	Me, Or, MC, Ind
111	<i>Machaerium acutifolium</i> Vogel		Me, Or, MC, Mel
112	<i>Echinodorus grandiflorus</i> (Cham. & Schldl.) Micheli	Cucharero	Mel
113	<i>Butia paraguayensis</i> (Barb. Rodr.) L.H. Bailey	Jata'i	Mel
114	<i>Commelina erecta</i> L.	Santa lucia hovy	Mel
115	<i>Pontederia azurea</i> Sw.	Aguape puru'a	Mel
116	<i>Pontederia cordata</i> L. var. <i>cordata</i>	Camalote	Mel
117	<i>Aspidosperma australe</i> Müll. Arg.	Kirandy	Mel
118	<i>Aspidosperma tomentosum</i> C. Mart.	kirandy del cerrado	Mel
119	<i>Aspilia montevidensis</i> (Spreng.) Kuntze		Mel
120	<i>Vernonanthura chamaedrys</i> (Less.) H. Rob.	Typycha moroti	Mel
121	<i>Celtis iguanaea</i> (Jacq.) Sarg.	Juasy'y	Mel
122	<i>Monteverdia ilicifolia</i> (Mart. ex Reissek) Biral	Cangorosa	Mel
123	<i>Diospyros lasiocalyx</i> (Mart.) B. Walln.		Mel
124	<i>Acosmium subelegans</i> (Mohlenbr.) Yakovlev		Mel
125	<i>Andira humilis</i> Mart. ex Benth.		Mel
126	<i>Samanea tubulosa</i> (Benth.) Barneby & J.W. Grimes	Manduvi ra	Mel
127	<i>Pleurophora saccocarpa</i> Koehne		Mel
128	<i>Eugenia moraviana</i> O. Berg		Mel
129	<i>Myrcianthes pungens</i> (O. Berg) D. Legrand	Guaviju	Mel
130	<i>Phyllanthus chacoensis</i> Morong	Jakare pito	Mel
131	<i>Scoparia montevidensis</i> (Spreng.) R. E. Fr.		Mel
132	<i>Rhamnidium elaeocarpum</i> Reissek	Taruma'i	Mel
133	<i>Spermacoce verticillata</i> L.	typycha corredor	Mel
134	<i>Zanthoxylum caribaeum</i> Lam. ssp. <i>rugosum</i> (A. St.-Hil. & Tul.) Reynel	Tembetary hu	Mel
135	<i>Xylosma venosa</i> N.E. Br.	Ñuati pyta	Mel
136	<i>Talisia angustifolia</i> Radlk.	Yvyra'i ka'i	Mel
137	<i>Copernicia alba</i> Morong	karanda'y	Mel, Co, Mc, In
138	<i>Calycophyllum multiflorum</i> Griseb.	Palo blanco	Mel, Com, MC
139	<i>Balfourodendron riedelianum</i> (Engl.) Engl.	Guatambu	Mel, In, MC
140	<i>Tabebuia aurea</i> (Silva Manso) Benth. & Hook. f. ex S. Moore	Paratodo	Mel, MC, Or, Ind, Fo, Co
141	<i>Bidens pilosa</i> L.	kapiuna	Mel, Me
142	<i>Acrocomia aculeata</i> (Jacq.) Lodd. ex Mart.	mbokaja	Mel, Me, Co, In, Or
143	<i>Agonandra brasiliensis</i> Miers ex Benth. & Hook. f.		Mel, Me, Fo, Ind, Co, MC
144	<i>Terminalia argentea</i> Mart.	Capitán	Mel, Me, Or, MC, Ind
145	<i>Attalea phalerata</i> Mart. ex Spreng.	Guacuri	Mel, Or, Fo, Co, Me, MC
146	<i>Jacaranda mimosifolia</i> D. Don	Jakaranda	Mel, Or, Me
147	<i>Prestonia tomentosa</i> R. Br.		Or

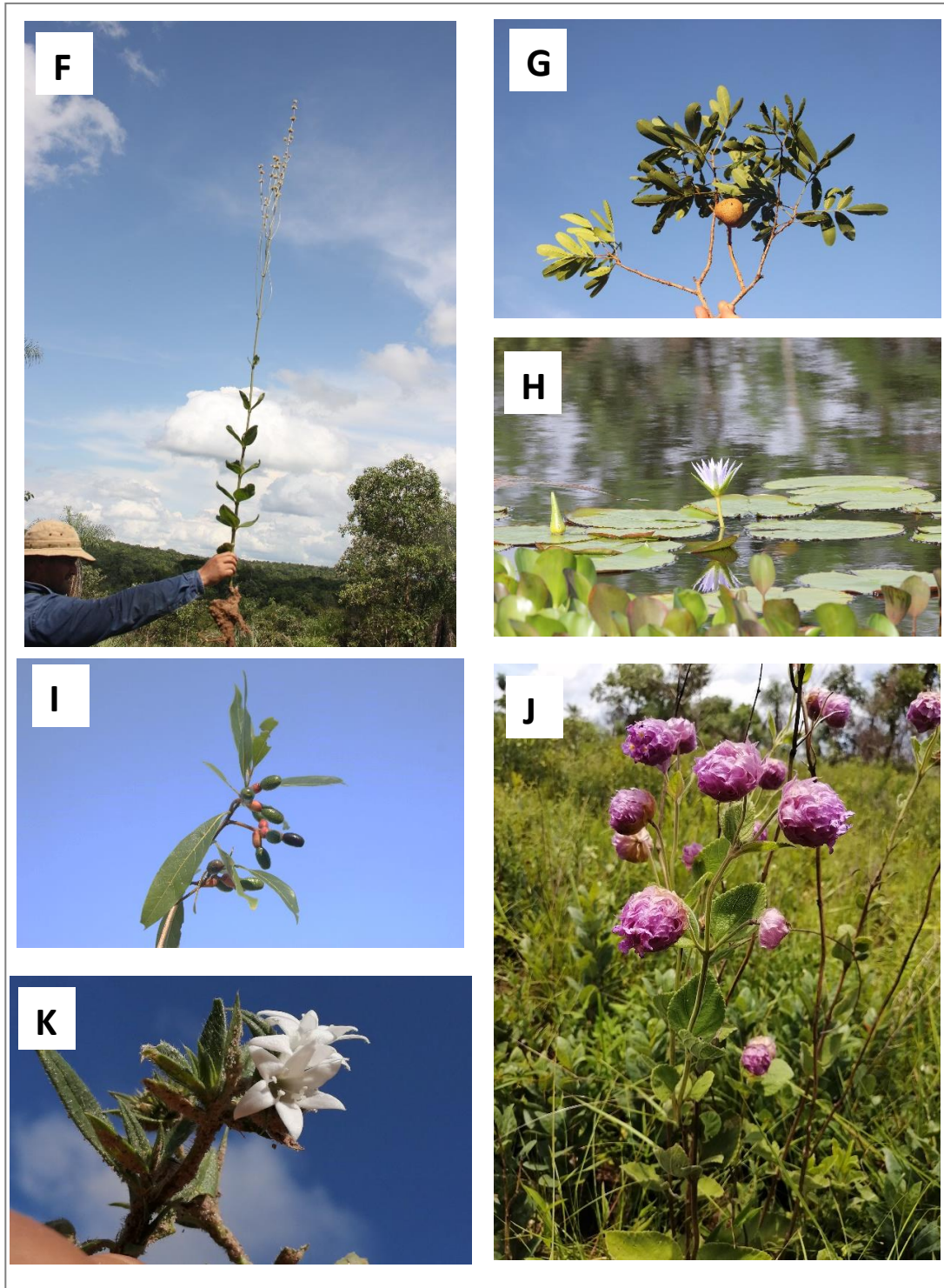
N°	Species and author	Common name in Spanish or Guarani	Uses
148	<i>Cereus stenogonus</i> K. Schum.	Tuna	Or, Co
149	<i>Opuntia elata</i> Link & Otto ex Salm- Dyck var. <i>cardiosperma</i> (K. Schum) R. Kiesling	Tuna de perro	Or, Co, Me
150	<i>Ceiba</i> sp.	samu'u	Or, Co, Me, In
151	<i>Tibouchina</i> sp.1	flor de cuaresma	Or, Fo
152	<i>Tocoyena formosa</i> (Cham. & Schltld.) K. Schum.		Or, Fo
153	<i>Tapirira guianensis</i> Aubl.	ka'ambota	Or, Fo, In
154	<i>Chrysophyllum gonocarpum</i> (Mart. & Eichler) Engl.	Aguai	Or, Fo, MC, Co
155	<i>Guarea macrophylla</i> Vahl ssp. <i>spiciflora</i> (A. Juss.) T.D. Penn.	Cedrillo	Or, Fo, MC, Mel
156	<i>Guettarda viburnoides</i> Cham. & Schltld.	angélica	Or, MC, Co, Fo
157	<i>Machaerium hirtum</i> (Vell.) Stellfeld		Or, MC, Me, Mel
158	<i>Psychotria carthagenensis</i> Jacq.	cafecito; maría molle	Or, Me
159	<i>Guarea guidonia</i> (L.) Sleumer	Cedro blanco	Or, Me, Fo, MC
160	<i>Cupania vernalis</i> Cambess.	Jagua rata'y pyta	Or, Mel, MC, Com
161	<i>Magonia pubescens</i> A. St.-Hil.	Yvyra hy'a	Or, Mel, Me, Ind, MC
162	<i>Plathymenia reticulata</i> Benth.	morosyvo sa'yju	Or, Mel, Me, MC, Ind

Ref.: Me (Medicinal); Mel (Meliferous); Co (Edible); Tin (dyeing properties); Fo (Forage); Mc (Building material); Or (Ornamental); Com (Fuel); Cos (Cosmetics); In (Industrial); To (Toxic)

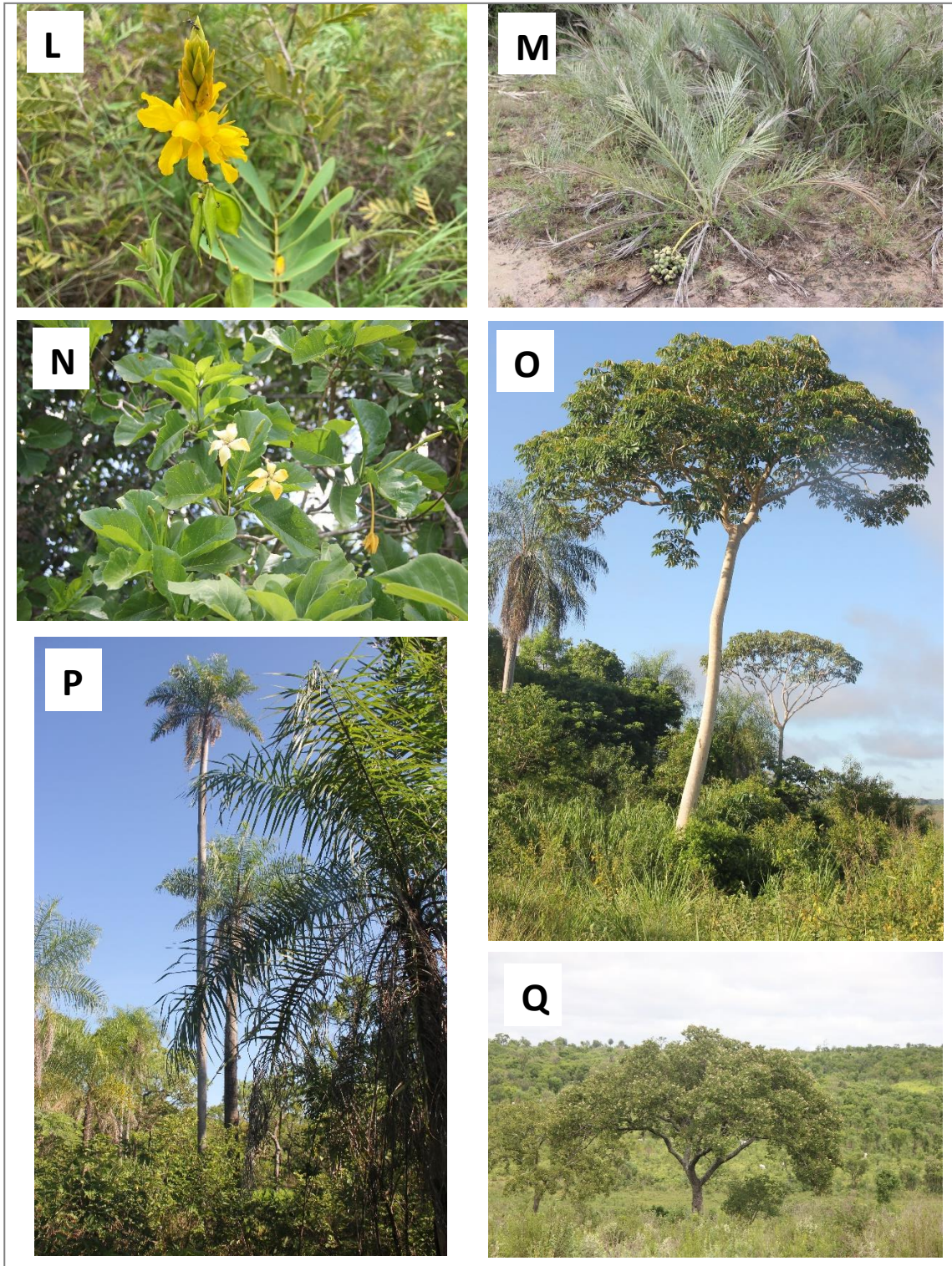
Set of photographs for some selected species recorded



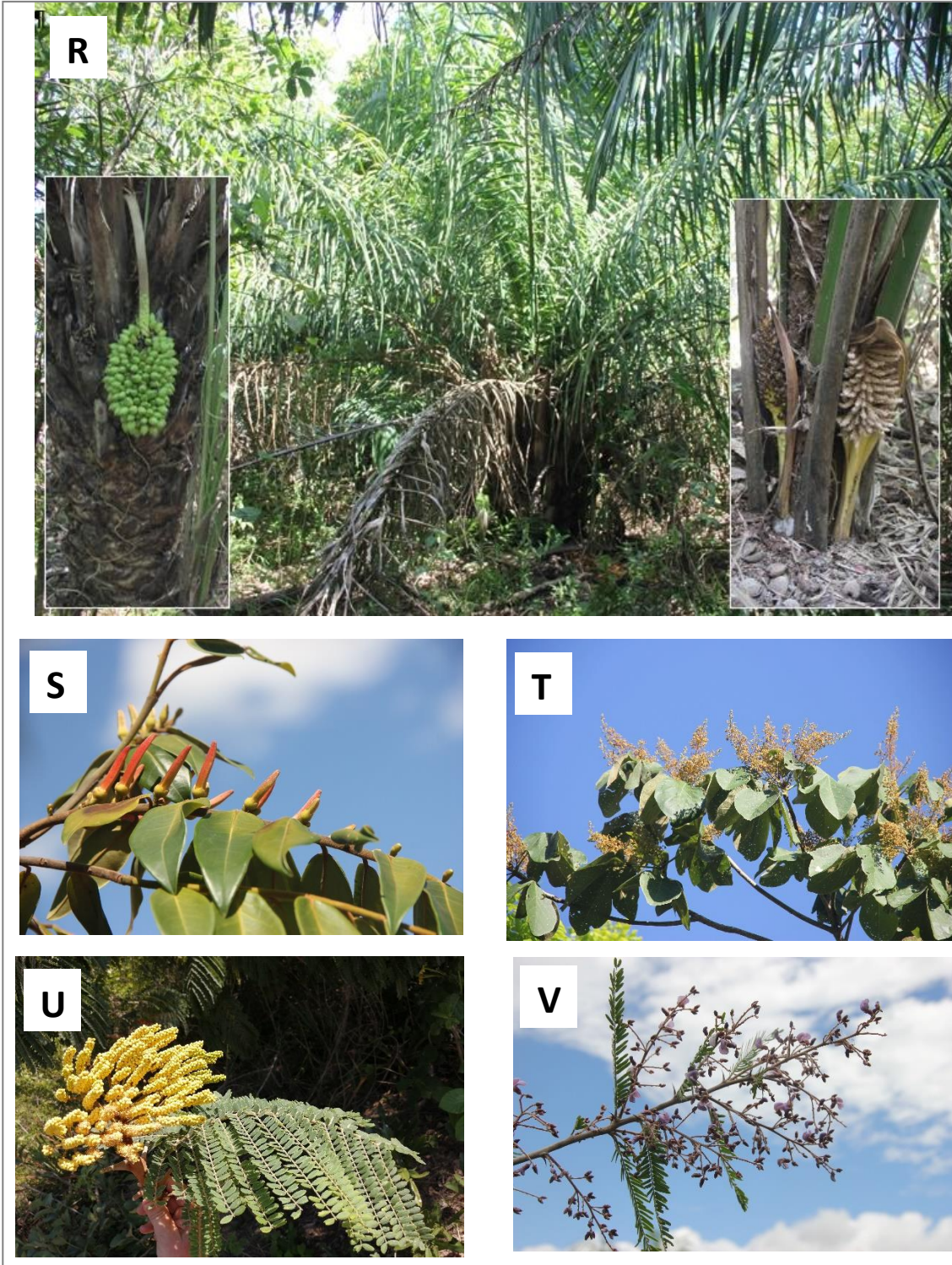
Ref.: A: *Discocactus hartmanii* (CR), B: *Bidens chodatii*, C: *Campomanesia adamantium*, D: *Cordia sessilis*, E: *Arachis pflugeae* (Lidia Pérez de Molas; L. González Soria)



Ref.: F: *Froelichia procera*, G: *Magonia pubescens*, H: *Nymphaea prolifera*, I: *Ocotea minarum*, J: *Lippia lupulina*, K: *Richardia grandiflora*. (Lidia Pérez de Molas; L. González Soria)



Ref.: L: *Senna paradyction*, M: *Syagrus campylospatha*, N: *Tocoyena formosa*, O: *Didymopanax morototoni*, P: *Acrocomia aculeata*, Q: *Hymenaea martiana*. (Lidia Pérez de Molas; L. González Soria)



Ref.: R: *Attalea phalerata*, S: *Xylopia aromática*, T: *Sterculia striata*, U: *Dimorphandra mollis*, V: *Machaerium hirtum*.

Methodology of work in field campaign



Ref.: A: Coordination among different taxonomic teams, B: Pre-processing of botanical sampling, C: Exchange and coordination with PARACEL technicians; D y E: Information gathering in sampling stations (EM)




The islets of forests

Islets present in plant formations, mainly in the Floodable Savannah (SI), are characterized by occupying the highest portions of the land and with a biodiversity represented by around 70 species of vascular plants that include Pteridophytes, Monocotyledons and Dicotyledons. In these formations there are herbs, shrubs, trees, vines and succulents such as the Cactaceae, the majority of terrestrial habits, and also some epiphytes. The edge of the islets is generally colonized by Bromeliaceae and Poaceas. Several of the species recorded on the islets are not present in the other plant formations, therefore their flora constitutes a rich contribution to the general biodiversity of the study area.

The islets are diverse in shape, size, biodiversity and distance from one another. In all cases, one or more anthills have been registered in them, and also termitehills (locally known as *takuru*), depending on the size of the islet. These anthills and *takuru* also always have holes that possibly serve as places of refuge for snakes, birds, rodents, and even wasps, bees and spiders. It is possible that the evolution of these forest islets exists in an association of ants and termites, which, by affecting the structure of the soil, allow organic matter to be carried to the depths and bring more infertile soil to the surface. This would facilitate the appearance of tree species with deeper roots, which would change the structure of the soil to facilitate the evolution of the islets.

Likewise, the islets would also serve as a resting place, roosting, feeding, nesting and socialization of certain species of birds and mammals. In addition, the scattered structure between grassland and savanna areas allows the arrangement of patches in the landscape, increasing the possibility of habitats for greater richness. These islets form the true structure of the "stepping stones".

The islets are therefore floristically and structurally functional parts of the vegetation mosaic, where the Floodplain is the main matrix and they are subjected to environmental conditions such as floods, droughts, fires and trampling of animals. Their importance lies in the fact that they are fundamental pieces that contribute to the stability and general connectivity of the system.

		
<p>Islet. Floodable savanna in Hermosa. Author: Lidia Pérez de Molas. Date: 2.4.2021</p>	<p>Islet. Floddable savanna in Santa Teresa. Author: Lidia Pérez de Molas. Date: 14.5.2021</p>	<p>Termitehill in Hermosa Islet. Author: Lidia Pérez de Molas. Date: 2.4.2021</p>

Ichthyology (fish)

List of species with common names in Spanish, Guarani and English

Nro.	Especie	Español	Guaraní	Inglés
1	<i>Acestrorhynchus pantaneiro</i>	Dientudo	<i>Pirá jaguá</i>	<i>Pike characin</i>
2	<i>Serrasalmus marginatus</i>	Piraña	<i>Pira aña</i>	<i>Piranha</i>
3	<i>Paradon nasus</i>	Violito		<i>Scrapetooth</i>
4	<i>Megaleporinus obtusidens</i>	Boga	<i>Pira petei</i>	<i>Headstander</i>
5	<i>Steindachnerina brevipinna</i>	Sabalito	<i>Carimbataí</i>	<i>Toothless Characin</i>
6	<i>Potamorhina squamoralevis</i>	Blanquillo		<i>Characin</i>
7	<i>Hoplias misionera</i>	Tararira	<i>Tare`yi</i>	<i>wolf fish</i>
8	<i>Pyrrhulina australis</i>	Pirrulina	<i>Piky</i>	<i>Pencilfish</i>
9	<i>Triportheus pantanensis</i>	Pechito	<i>Pirá Guyra</i>	<i>Characin</i>
10	<i>Charax leticiae</i>	Dientudo jorobado		<i>Characin</i>
11	<i>Astyanax lacustris</i>	Mojarra	<i>Piky</i>	<i>Tetra</i>
12	<i>Astyanax lineatus</i>	Mojarra	<i>Piky</i>	<i>Tetra</i>
13	<i>Psellogrammus kennedyi</i>	Mojarrita	<i>Piky</i>	<i>Tetra</i>
14	<i>Hemigrammus ulreyi</i>	Mojarrita	<i>Piky</i>	<i>Tetra</i>
15	<i>Bryconamericus exodon</i>	Mojarrita	<i>Piky</i>	<i>Tetra</i>
16	<i>Moenkhausia dichroua</i>	Colita negra	<i>Piky</i>	<i>Tetra</i>
17	<i>Moenkhausia bonita</i>	Colita negra	<i>Piky</i>	<i>Tetra</i>
18	<i>Moenkhausia sanctaefilomenae</i>	Colita negra	<i>Piky</i>	<i>Tetra</i>
19	<i>Odontostilbe pequirá</i>	Mojarra	<i>Piky</i>	<i>Tetra</i>
20	<i>Gymnocorymbus ternetzi</i>	Monjita	<i>Piky</i>	<i>Black tetra</i>
21	<i>Poptella paraguayensis</i>	Pechito	<i>Piky</i>	<i>Tetra</i>
22	<i>Tetragonopterus argenteus</i>	Relojito	<i>Piky</i>	<i>Tetra</i>
23	<i>Hyphessobrycon eques</i>	Mojarra/Tetra	<i>Piky</i>	<i>Tetra</i>
24	<i>Aphyocharax anisitsi</i>	Mojarra/Colita roja	<i>Piky</i>	<i>Bloodfin tetra</i>
25	<i>Aphyocharax rathbuni</i>	Tetra/Aleta de sangre	<i>Piky</i>	<i>Redflank bloodfin</i>
26	<i>Characidium</i> sp.	Mojarra/Tetra	<i>Piky</i>	<i>Characin</i>
27	<i>Characidium</i> sp.1	Mojarra/Tetra	<i>Piky</i>	<i>Characin</i>
28	<i>Characidium</i> sp.2	Mojarra/Tetra	<i>Piky</i>	<i>Characin</i>
29	<i>Trachelyopterus galeatus</i>	Apretador	<i>Tajopy</i>	<i>Driftwood catfish</i>
30	<i>Pterodoras granulosus</i>	Armado		<i>Granulated catfish</i>
31	<i>Platydoras armatulus</i>	Armado		<i>Granulated catfish</i>
32	<i>Pimelodella</i> sp.	Bagre cantor	<i>Mandi-í</i>	<i>Catfish</i>

The ichthyofauna and its taxonomy

Registered species, organized in sequence according to their phylogenetic classification with common names and their distribution. The authorship of the scientific names used for the species records is also indicated.

	<i>Species</i>	Author	Common name	Distributional range
ACTINOPTERI				
MYLIOBATIFORMES				
Potamotrygonidae				
1	<i>Potamotrygon motoro</i>	Mueller & Henle, 1841	Raya	Nativa
2	<i>Potamotrygon</i> sp.	Garman, 1877	Raya	Nativa
CHARACIFORMES				
Acestrorhynchidae				
3	<i>Acestrorhynchus pantaneiro</i>	Menezes 1992	Pirá jaguá	Nativa
Serrasalmidae				
4	<i>Serrasalmus marginatus</i>	Valenciennes 1837	Piraña	Nativa
Parodontidae				
5	<i>Parodon nasus</i>	Valenciennes, 1850	Violito	Nativa
Anostomidae				
6	<i>Megaleporinus obtusidens</i>	Valenciennes, 1837	Boga	Nativa
Curimatidae				
7	<i>Curimatopsis</i> sp	Steindachner, 1876	Carimbataí	Nativa
8	<i>Potamorhina squamoralevis</i>	Braga & Azpelicueta 1983	Blanquillo	Nativa
9	<i>Steindachnerina brevipinna</i>	Eigenmann & Eigenmann, 1889	Carimbataí	Nativa
Erythrinidae				
10	<i>Hoplias misionera</i>	Rosso, Mabrugaña, González-Castro, Delpiani, Avigliano, Schenone & Díaz de Astarloa, 2016	Tararira	Nativa
Lebiasinidae				
11	<i>Pyrhulina australis</i>	Eigenmann & Kennedy, 1903	Pirrulina	Nativa
Triporthidae				
12	<i>Triporthus pantanensis</i>	Malabarba, 2004	Pechito	Nativa
Characidae				
13	<i>Charax leticiae</i>	Lucena, 1987	Dientudo jorobado	Nativa
14	<i>Roeboides microlepis</i>	Reinhardt, 1851)	Dientudo jorobado	Nativa
15	<i>Astyanax</i> cf. <i>alleni</i>	Eigenmann & McAtee, 1907	Mojarra	Nativa
16	<i>Astyanax lacustris</i>	Lütken 1875	Mojarra	Nativa
17	<i>Astyanax lineatus</i>	Perugia, 1891	Mojarra	Nativa

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18	<i>Psellogrammus kennedyi</i>	Eigenmann, 1903	Mojarra	Nativa
19	<i>Bryconops melanurus</i>	Bloch, 1794	Mojarra	Nativa
20	<i>Hemigrammus ulreyi</i>	Boulenger, 1895	Mojarra	Nativa
21	<i>Bryconamericus exodon</i>	Eigenmann, 1907	Mojarra	Nativa
22	<i>Moenkhausia dichroua</i>	Kner, 1858	Mojarra	Nativa
23	<i>Moenkhausia bonita</i>	Benine, Castro & Sabino 2004	Mojarra	Nativa
24	<i>Moenkhausia sanctaefilomenae</i>	Steindachner, 1907	Mojarra	Nativa
25	<i>Odontostilbe pequirá</i>	Steindachner, 1882	Mojarra	Nativa
26	<i>Serrapinnus</i> sp.	Malabarba, 1998	Mojarra	Nativa
27	<i>Piabucus melanostoma</i>	Holmberg, 1891	Mojarrita	Nativa
28	<i>Gymnocorymbus ternetzi</i>	Boulenger, 1895)	Monjita	Nativa
29	<i>Poptella paraguayensis</i>	Eigenmann, 1907	Mojarra	Nativa
30	<i>Tetragonopterus argenteus</i>	Cuvier, 1816	Mojarra	Nativa
31	<i>Hyphessobrycon eques</i>	Steindachner, 1882	Mojarra	Nativa
32	<i>Aphyocharax anisitsi</i>	Eigenmann & Kennedy, 1903	Mojarra	Nativa
33	<i>Aphyocharax dentatus</i>	Eigenmann & Kennedy, 1903	Mojarra	Nativa
34	<i>Aphyocharax nattereri</i>	Steindachner, 1882	Mojarra	Nativa
35	<i>Aphyocharax rathbuni</i>	Eigenmann, 1907	Mojarra	Nativa
Crenuchidae				
36	<i>Characidium</i> sp.	Reinhardt, 1867	Mojarra	Nativa
37	<i>Characidium</i> sp.1	Reinhardt, 1867	Mojarra	Nativa
38	<i>Characidium</i> sp.2	Reinhardt, 1867	Mojarra	Nativa
SILURIFORMES				
Auchenipteridae				
39	<i>Trachelyopterus galeatus</i>	Linnaeus 1766	Apretador	Nativa
Doradidae				
40	<i>Pterodoras granulosus</i>	Valenciennes 1821	Armado	Nativa
41	<i>Platydoras armatulus</i>	Valenciennes, 1840	Armado	Nativa
Pimelodidae				
42	<i>Pimelodus maculatus</i>	Lacépède, 1803	Mandi-í	Nativa
Pseudopimelodidae				
43	<i>Microglanis carlae</i>	Vera-Alcaraz, da Graça & Shibatta 2008	Bagre de la piedras	Nativa
44	<i>Pseudopimelodus</i> sp.	Bleeker 1858	Manguruyu	Nativa
Heptapteridae				
45	<i>Rhamdia</i> sp.	Bleeker 1858	Jurundi-á	Nativa
46	<i>Rhamdia quelen</i>	(Quoy & Gaimard, 1824)	Jurundi-á	Nativa
47	<i>Pimelodella</i> sp.	Eigenmann & Eigenmann, 1888	Mandi-í	Nativa
48	<i>Pimelodella gracilis</i>	Valenciennes, 1835	Mandi-í	Nativa

49	<i>Pimelodella</i> sp.1	Eigenmann & Eigenmann, 1888	Mandi-í cobí	Nativa
Aspredinidae				
50	<i>Amaralia oviraptor</i>	Friel & Carvalho, 2016	Guitarrita	Nativa
51	<i>Pseudobunocephalus</i> sp.	Friel, 2008	Guitarrita	Nativa
Callichthyidae				
52	<i>Corydoras aeneus</i>	Gill, 1858	Tachuela	Nativa
53	<i>Corydoras aurofrenatus</i>	Eigenmann & Kennedy, 1903	Tachuela	Nativa
54	<i>Corydoras hastatus</i>	Eigenmann & Eigenmann, 1888	Tachuela	Nativa
Trichomycteridae				
55	<i>Trichomycterus</i> sp.	Valenciennes, 1832		Nativa
56	<i>Paravandellia oxyptera</i>	Miranda Ribeiro, 1912	Candiru	Nativa
Callichthyidae				
57	<i>Callichthys callichthys</i>	Linnaeus, 1758	Cascarudo	Nativa
Loricariidae				
58	<i>Hypoptopoma inexpectatum</i>	Holmberg, 1893	Vieja de agua	Nativa
59	<i>Otocinclus</i> sp.	Cope, 1871	Limpia vidrio	Nativa
60	<i>Otothyropsis</i> sp.	Ribeiro, Carvalho & Melo, 2005	Limpia vidrio	Nativa
61	<i>Ancistrus pirareta</i>	Muller, 1989	Vieja de agua	Nativa
62	<i>Ancistrus piriformis</i>	Muller, 1989	Vieja de agua	Nativa
63	<i>Hypostomus</i> sp.	Lacepède, 1803	Vieja de agua	Nativa
64	<i>Hypostomus</i> sp.1	Lacepède, 1804	Vieja de agua	Nativa
65	<i>Farlowella paraguayensis</i>	Retzer & Page, 1997	Vieja de agua	Nativa
66	<i>Loricaria</i> sp.	Linnaeus, 1758	Vieja de agua	Nativa
67	<i>Rineloricaria aurata</i>	Knaack, 2002	Vieja de agua	Nativa
68	<i>Rineloricaria lanceolata</i>	Guenther, 1868	Vieja de agua	Nativa
GYMNOTIFORMES				
Sternopygidae				
69	<i>Eigenmannia trilineata</i>	López & Castello, 1966	Banderita	Nativa
70	<i>Eigenmannia virescens</i>	Valenciennes, 1842	Banderita	Nativa
71	<i>Sternopygus macrurus</i>	Bloch & Schneider, 1801	Cuchilla	Nativa
Rhamphichthyidae				
72	<i>Gymnorhamphichthys britskii</i>	Carvalho, Ramos & Albert, 2011	Morenita	Nativa
Hypopomidae				
73	<i>Brachyhypopomus gauderio</i>	Giora & Malabarba, 2009	Morenita	Nativa
Gymnotidae				
74	<i>Gymnotus pantanal</i>	Fernandes, Albert, Daniel-Silva, Lopes, Crampton & Almeida-Toledo, 2005	Morenita	Nativa
BELONIFORMES				
Belonidae				

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75	<i>Potamorrhaphis eigenmanni</i>	Miranda Ribeiro, 1915	Pez aguja	Nativa
SYNBRANCHIFORMES				
76	<i>Synbranchus marmoratus</i>	Bloch, 1795	Anguila	Nativa
CICHLIFORMES				
Cichlidae				
77	<i>Bujurquina vittata</i>	Heckel, 1840	Acara de bandas	Nativa
78	<i>Cichlasoma dimerus</i>	Heckel, 1840	Chanchita	Nativa
79	<i>Crenicichla lepidota</i>	Heckel, 1840	Juanita	Nativa
80	<i>Crenicichla mandelburgeri</i>	Kullander, 2009	Juanita	Nativa
81	<i>Gymnogeophagus balzanii</i>	Perugia, 1891	Acará	Nativa

List of species by sampling areas

N	Especie	Gav	Tre	Sol	SLib	Sta. Ter	Zap	Her
1	<i>Acestrorhynchus pantaneiro</i>	x				x		
2	<i>Serrasalmus marginatus</i>	x						
3	<i>Paradon nasus</i>			x				
4	<i>Megaleporinus obtusidens</i>	x				x		
5	<i>Steindachnerina brevipinna</i>	x	x					
6	<i>Potamorhina squamoralevis</i>	x					x	
7	<i>Hoplias misionera</i>	x	x		x	x	x	x
8	<i>Pyrrhulina australis</i>	x	x			x	x	
9	<i>Triportheus pantanensis</i>	x	x					
10	<i>Charax leticiae</i>		x					
11	<i>Astyanax lacustris</i>		x	x	x	x	x	x
12	<i>Astyanax lineatus</i>		x		x	x	x	x
13	<i>Psellogrammus kennedyi</i>	x	x	x				x
14	<i>Hemigrammus ulreyi</i>		x			x		
15	<i>Bryconamericus exodon</i>	x				x	x	x
16	<i>Moenkhausia dichrourea</i>	x	x	x		x	x	x
17	<i>Moenkhausia bonita</i>	x	x			x	x	x
18	<i>Moenkhausia sanctaefilomenae</i>	x		x		x	x	x
19	<i>Odontostilbe pequirá</i>	x	x		x	x	x	x
20	<i>Gymnocorymbus ternetzi</i>	x	x			x		
21	<i>Poptella paraguayensis</i>		x			x	x	x
22	<i>Tetragonopterus argenteus</i>	x					x	
23	<i>Hyphessobrycon eques</i>	x	x	x		x	x	x
24	<i>Aphyocharax anisitsi</i>	x	x	x		x	x	x
25	<i>Aphyocharax rathbuni</i>	x	x					
26	<i>Characidium sp.</i>	x		x	x			
27	<i>Characidium sp.1</i>		x	x	x			x
28	<i>Characidium sp.2</i>			x			x	x
29	<i>Trachelyopterus galeatus</i>		x					
30	<i>Pterodoras granulosus</i>		x					
31	<i>Platydoras armatulus</i>		x					
32	<i>Pimelodella sp.</i>	x	x	x		x	x	x
33	<i>Pimelodella sp.1</i>	x						x
34	<i>Rhamdia sp.</i>			x				
35	<i>Rhamdia quelen</i>	x					x	x
36	<i>Amaralia oviraptor</i>	x						
37	<i>Corydoras aurofrenatus</i>					x		x
38	<i>Corydoras aeneus</i>			x		x		x
39	<i>Corydoras hastatus</i>	x						

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N	Especie	Gav	Tre	Sol	Slib	Sta. Ter	Zap	Her
40	<i>Ancistrus pirareta</i>		x		x	x		
41	<i>Rineloricaria aurata</i>				x			
42	<i>Otocinclus</i> sp.				x	x	x	x
43	<i>Eigenmannia trilineata</i>	x						
44	<i>Brachyhyopomus gauderio</i>	x						
45	<i>Gymnotus pantanal</i>	x				x		
46	<i>Potamorrhaphis eigenmanni</i>	x				x		
47	<i>Bujurquina vittata</i>	x	x					
48	<i>Cichlasoma dimerus</i>		x	x		x	x	x
49	<i>Crenicichla lepidota</i>	x				x	x	x
50	<i>Gymnogeophagus balzanii</i>		x					x
51	<i>Pseudopimelodus</i> sp.				x			
52	<i>Crenicichla mandelburgeri</i>							x
53	<i>Gymnorhamphichthys britskii</i>					x		
54	<i>Rineloricaria lanceolata</i>							x
55	<i>Loricaria</i> sp.							x
56	<i>Hypostomus</i> sp.					x	x	
57	<i>Pimelodella gracilis</i>							x
58	<i>Microglanis carlae</i>					x		
59	<i>Pimelodus maculatus</i>						x	
60	<i>Serrapinnus</i> sp.					x		x
61	<i>Curimatopsis</i> sp						x	x
62	<i>Bryconops melanurus</i>					x		
63	<i>Otothyropsis</i> sp.					x	x	x
64	<i>Paravandellia oxyptera</i>					x	x	
65	<i>Piabucus melanostoma</i>	x				x		
66	<i>Sternopygus macrurus</i>					x		
67	<i>Eigenmannia virescens</i>					x		
68	<i>Farlowella paraguayensis</i>					x		
69	<i>Hypostomus</i> sp. 1					x		
70	<i>Potamotrygon motoro</i>		x			x		
71	<i>Potamotrygon</i> sp.					x		
72	<i>Ancistrus piriformis</i>							x
73	<i>Roeboides microlepis</i>		x					
74	<i>Aphyocharax nattereri</i>	x	x			x	x	x
75	<i>Aphyocharax dentatus</i>	x	x		x	x	x	x
76	<i>Symbranchus marmoratus</i>	x		x				
77	<i>Callichthys callichthys</i>				x			
78	<i>Hypoptopoma inexpectatum</i>			x				

N	Especie	Gav	Tre	Sol	SLib	Sta. Ter	Zap	Her
79	<i>Trichomycterus</i> sp.				x			
80	<i>Astyanax cf. alleni</i>	x						
81	<i>Pseudobunocephalus</i> sp		x					
	Total de especies por estancia	36	31	16	13	41	27	33

Ref.: Gav: Gavilán; Tre: Trementina; Sol: Soledad; S. Lib: San Liberato; Sta. Ter: Sta Teresa; Zap: Zapallo; Her: Hermosa

Usage of recorded species in different fishing practices.

N	Scientific names	Subsistence	Commercial	Ornamental
1	<i>Acestrorhynchus pantaneiro</i>	X	X	
2	<i>Serrasalmus marginatus</i>	X	X	
3	<i>Paradon nasus</i>			X
4	<i>Megaleporinus obtusidens</i>	X	X	
5	<i>Steindachnerina brevipinna</i>			X
6	<i>Potamorhina squamoralevis</i>	X		
7	<i>Hoplias misionera</i>	X	X	
8	<i>Pyrrhulina australis</i>			
9	<i>Triportheus pantanensis</i>			X
10	<i>Charax leticiae</i>			
11	<i>Astyanax lacustris</i>			X
12	<i>Astyanax lineatus</i>			X
13	<i>Psellogrammus kennedyi</i>			
14	<i>Hemigrammus ulreyi</i>			X
15	<i>Bryconamericus exodon</i>			X
16	<i>Moenkhausia dichroua</i>			X
17	<i>Moenkhausia bonita</i>			X
18	<i>Moenkhausia sanctaefilomenae</i>			X
19	<i>Odontostilbe pequirá</i>			X
20	<i>Gymnocorymbus ternetzi</i>			X
21	<i>Poptella paraguayensis</i>			
22	<i>Tetragonopterus argenteus</i>			
23	<i>Hyphessobrycon eques</i>			X
24	<i>Aphyocharax anisitsi</i>			X
25	<i>Aphyocharax rathbuni</i>			X
26	<i>Characidium sp.</i>			
27	<i>Characidium sp.1</i>			
28	<i>Characidium sp.2</i>			
29	<i>Trachelyopterus galeatus</i>			
30	<i>Pterodoras granulosus</i>			
31	<i>Platydoras armatulus</i>			
32	<i>Pimelodella sp.</i>	X	X	
33	<i>Pimelodella sp.1</i>	X	X	
34	<i>Rhamdia sp.</i>	X		
35	<i>Rhamdia quelen</i>	X		
36	<i>Amaralia oviraptor</i>			X
37	<i>Corydoras aurofrenatus</i>			
38	<i>Corydoras aeneus</i>			X
39	<i>Corydoras hastatus</i>			X
40	<i>Ancistrus pirareta</i>			X
41	<i>Rineloricaria aurata</i>			
42	<i>Otocinclus sp.</i>			X
43	<i>Eigenmannia trilineata</i>			
44	<i>Brachyhyppopomus gauderio</i>			
45	<i>Gymnotus pantanal</i>		X	
46	<i>Potamorhaphis eigenmanni</i>			
47	<i>Bujurquina vittata</i>			X
48	<i>Cichlasoma dimerus</i>			X

N	Scientific names	Subsistence	Commercial	Ornamental
49	<i>Crenicichla lepidota</i>			
50	<i>Gymnogeophagus balzanii</i>			X
51	<i>Pseudopimelodus sp.</i>	X		
52	<i>Crenicichla mandelburgeri</i>			
53	<i>Gymnorhamphichthys britskii</i>			
54	<i>Rineloricaria lanceolata</i>			
55	<i>Loricaria sp.</i>			
56	<i>Hypostomus sp.</i>			
57	<i>Pimelodella gracilis</i>		X	
58	<i>Microglanis carlae</i>			
59	<i>Pimelodus maculatus</i>		X	
60	<i>Serrapinnus sp.</i>			
61	<i>Curimatopsis sp</i>			
62	<i>Bryconops melanurus</i>			
63	<i>Otothyropsis sp.</i>			
64	<i>Paravandellia oxyptera</i>			
65	<i>Piabucus melanostoma</i>			
66	<i>Sternopygus macrurus</i>			x
67	<i>Eigenmannia virescens</i>			
68	<i>Farlowella paraguayensis</i>			
69	<i>Hipostomus sp. 1</i>			
70	<i>Potramotrygon motoro</i>			
71	<i>Potamotrygon sp.</i>			
72	<i>Ancistrus piriformis</i>			
73	<i>Roeboides microlepis</i>			x
74	<i>Aphyocharax nattereri</i>			
75	<i>Aphyocharax dentatus</i>			
76	<i>Symbranchus marmoratus</i>			
77	<i>Callichthys callichthys</i>			x
78	<i>Hypoptopoma inexpectatum</i>			
79	<i>Trichomycterus sp.</i>			
80	<i>Astyanax cf. alleni</i>			
81	<i>Pseudobunocephalus sp</i>			

Absolute and relative abundance of fish

No of species (n = 4.458)	Absolute abundance	Relative abundance
<i>Corydoras aeneus</i>	1088	24,41
<i>Odontostilbe pequirá</i>	702	15,75
<i>Aphyocharax anisitsi</i>	200	4,49
<i>Hyphessobrycon eques</i>	198	4,44
<i>Astyanax lineatus</i>	184	4,13
<i>Astyanax lacustris</i>	183	4,10
<i>Bryconamericus exodon</i>	164	3,68
<i>Moenkhausia bonita</i>	157	3,52
<i>Moenkhausia dichroua</i>	138	3,10
<i>Gymnocorymbus ternetzi</i>	98	2,20

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No of species (n = 4.458)	Absolute abundance	Relative abundance
<i>Poptella paraguayensis</i>	92	2,06
<i>Otocinclus sp.</i>	85	1,91
<i>Paravandellia oxyptera</i>	78	1,75
<i>Bujurquina vittata</i>	77	1,73
<i>Moenkhausia sanctaefilomenae</i>	69	1,55
<i>Psellogrammus kennedyi</i>	58	1,30
<i>Otothyropsis sp.</i>	58	1,30
<i>Pimelodella sp.</i>	56	1,26
<i>Hemigrammus ulreyi</i>	52	1,17
<i>Corydoras aurofrenatus</i>	49	1,10
<i>Aphyocharax nattereri</i>	44	0,99
<i>Steindachnerina brevipinna</i>	41	0,92
<i>Aphyocharax dentatus</i>	38	0,85
<i>Cichlasoma dimerus</i>	34	0,76
<i>Characidium sp.2</i>	31	0,70
<i>Crenicichla lepidota</i>	31	0,70
<i>Hoplias misionera</i>	30	0,67
<i>Microglanis carlae</i>	28	0,63
<i>Rhamdia quelen</i>	26	0,58
<i>Pyrrhulina australis</i>	25	0,56
<i>Triportheus pantanensis</i>	24	0,54
<i>Aphyocharax rathbuni</i>	23	0,52
<i>Pimelodella gracilis</i>	19	0,43
<i>Piabucus melanostoma</i>	18	0,40
<i>Characidium sp.</i>	17	0,38
<i>Characidium sp.1</i>	17	0,38
<i>Pimelodella sp.1</i>	17	0,38
<i>Rineloricaria lanceolata</i>	17	0,38
<i>Ancistrus pirareta</i>	16	0,36
<i>Hypostomus sp.</i>	15	0,34
<i>Platydoras armatulus</i>	12	0,27
<i>Gymnogeophagus balzanii</i>	12	0,27
<i>Megaleporinus obtusidens</i>	10	0,22
<i>Tetragonopterus argenteus</i>	9	0,20
<i>Eigenmannia trilineata</i>	8	0,18
<i>Gymnotus pantanal</i>	8	0,18
<i>Pimelodus maculatus</i>	8	0,18
<i>Curimatopsis sp.</i>	8	0,18
<i>Potamorhaphis eigenmanni</i>	7	0,16
<i>Brachyhypopomus gauderio</i>	6	0,13

No of species (n = 4.458)	Absolute abundance	Relative abundance
<i>Bryconops melanurus</i>	6	0,13
<i>Corydoras hastatus</i>	5	0,11
<i>Paradon nasus</i>	4	0,09
<i>Charax leticiae</i>	4	0,09
<i>Amaralia oviraptor</i>	4	0,09
<i>Rineloricaria aurata</i>	4	0,09
<i>Crenicichla mandelburgeri</i>	4	0,09
<i>Serrapinnus sp.</i>	4	0,09
<i>Ancistrus piriformis</i>	4	0,09
<i>Acestrorhynchus pantaneiro</i>	3	0,07
<i>Rhamdia sp.</i>	3	0,07
<i>Farlowella paraguayensis</i>	3	0,07
<i>Serrasalmus marginatus</i>	2	0,04
<i>Potamorhina squamoralevis</i>	2	0,04
<i>Eigenmannia virescens</i>	2	0,04
<i>Hipostomus sp. 1</i>	2	0,04
<i>Potramotrygon motoro</i>	2	0,04
<i>Symbranchus marmoratus</i>	2	0,04
<i>Trachelyopterus galeatus</i>	1	0,02
<i>Pterodoras granulosis</i>	1	0,02
<i>Pseudopimelodus sp.</i>	1	0,02
<i>Gymnorhamphichthys britskii</i>	1	0,02
<i>Loricaria sp.</i>	1	0,02
<i>Sternopygus macrurus</i>	1	0,02
<i>Potamotrygon sp.</i>	1	0,02
<i>Roeboides microlepis</i>	1	0,02
<i>Callichthys callichthys</i>	1	0,02
<i>Hypoptopoma inexpectatum</i>	1	0,02
<i>Trichomycterus sp.</i>	1	0,02
<i>Astyanax cf. alleni</i>	1	0,02
<i>Pseudobunocephalus sp</i>	1	0,02

Abundance of total fish species per sampling area

No	Species	Gav	Tre	Sol	Lib	Sta. Ter	Zap	Her	Total
1	<i>Acestrorhynchus pantaneiro</i>	1				2			3
2	<i>Serrasalmus marginatus</i>	2							2
3	<i>Parodon nasus</i>			4					4
4	<i>Megaleporinus obtusidens</i>	7	1			2			10
5	<i>Steindachnerina brevipinna</i>	15	14	10	1	1			41
6	<i>Potamorhina squamoralevis</i>	1					1		2
7	<i>Hoplias misionera</i>	9	7	4	3	1	2	4	30
8	<i>Pyrrhulina australis</i>	16	4			2	3		25
9	<i>Triportheus pantanensis</i>	15	8			1			24
10	<i>Charax leticiae</i>	2	2						4
11	<i>Astyanax lacustris</i>	2	56	16	48	45	9	7	183
12	<i>Astyanax lineatus</i>		76	54	12	10	19	13	184
13	<i>Psellogrammus kennedyi</i>	12	25	8				13	58
14	<i>Hemigrammus ulreyi</i>	4	35			12	1		52
15	<i>Bryconamericus exodon</i>	20	4	90		22	11	17	164
16	<i>Moenkhausia dichroua</i>	36	10	19		32	26	15	138
17	<i>Moenkhausia bonita</i>	23	8	78		20	15	13	157
18	<i>Moenkhausia sanctaefilomenae</i>	5		23		30	6	5	69
19	<i>Odontostilbe pequirá</i>	226	70	61	55	141	118	31	702
20	<i>Gymnocorymbus ternetzi</i>	12	85			1			98
21	<i>Poptella paraguayensis</i>	13	12			33	18	16	92
22	<i>Tetragonopterus argenteus</i>	6					3		9
23	<i>Hyphessobrycon eques</i>	138	23	15		11	5	6	198
24	<i>Aphyocharax anisitsi</i>	37	42	3	4	50	36	28	200
25	<i>Aphyocharax rathbuni</i>	17	6						23
26	<i>Characidium</i> sp.	12		3	2				17
27	<i>Characidium</i> sp.1	4	4	3	4			2	17
28	<i>Characidium</i> sp.2	6	10	1			8	6	31
29	<i>Trachelyopterus galeatus</i>		1						1
30	<i>Pterodoras granulosus</i>		1						1
31	<i>Platydoras armatulus</i>		12						12
32	<i>Pimelodella</i> sp.	2	3	11	10	6	19	5	56
33	<i>Pimelodella</i> sp.1	3					11	3	17
34	<i>Rhamdia</i> sp.			3					3
35	<i>Rhamdia quelen</i>	4		2	4		2	14	26
36	<i>Amaralia oviraptor</i>	3				1			4
37	<i>Corydoras aurofrenatus</i>				40	4		5	49
38	<i>Corydoras aeneus</i>	1		444	251	69		323	1088
39	<i>Corydoras hastatus</i>	5							5
40	<i>Ancistrus pirareta</i>		2	1	5	8			16

No	Species	Gav	Tre	Sol	Lib	Sta. Ter	Zap	Her	Total
41	<i>Rineloricaria aurata</i>			1	2	1			4
42	<i>Otocinclus sp.</i>	1			22	12	45	5	85
43	<i>Eigenmannia trilineata</i>	3				3	2		8
44	<i>Brachyhyopomus gauderio</i>	2	2			2			6
45	<i>Gymnotus pantanal</i>	5	2			1			8
46	<i>Potamorrhaphis eigenmanni</i>	1				6			7
47	<i>Bujurquina vittata</i>	36	5	22		12	2		77
48	<i>Cichlasoma dimerus</i>	6	3	6	4	3	8	4	34
49	<i>Crenicichla lepidota</i>	11	2			11	2	5	31
50	<i>Gymnogeophagus balzanii</i>	2	7		1			2	12
51	<i>Pseudopimelodus sp.</i>				1				1
52	<i>Crenicichla mandelburgeri</i>				2			2	4
53	<i>Gymnorhamphichthys britskii</i>					1			1
54	<i>Rineloricaria lanceolata</i>					11	3	3	17
55	<i>Loricaria sp.</i>							1	1
56	<i>Hypostomus sp.</i>			1		8	6		15
57	<i>Pimelodella gracilis</i>	2			6	4	2	5	19
58	<i>Microglanis carlae</i>				2	16	10		28
59	<i>Pimelodus maculatus</i>						8		8
60	<i>Serrapinnus sp.</i>					1		3	4
61	<i>Curimatopsis sp.</i>						3	5	8
62	<i>Bryconops melanurus</i>		2			4			6
63	<i>Otothyropsis sp.</i>				12	6	39	1	58
64	<i>Paravandellia oxyptera</i>					37	41		78
65	<i>Piabucus melanostoma</i>	12				6			18
66	<i>Sternopygus macrurus</i>					1			1
67	<i>Eigenmannia virescens</i>					2			2
68	<i>Farlowella paraguayensis</i>					3			3
69	<i>Hipostomus sp. 1</i>					2			2
70	<i>Potramotrygon motoro</i>		1			1			2
71	<i>Potamotrygon sp.</i>					1			1
72	<i>Ancistrus piriformis</i>							4	4
73	<i>Roeboides microlepis</i>		1						1
74	<i>Aphyocharax nattereri</i>	20	2			9	6	7	44
75	<i>Aphyocharax dentatus</i>	8	4		6	8	7	5	38
76	<i>Synbranchus marmoratus</i>	1		1					2
77	<i>Callichthys callichthys</i>				1				1
78	<i>Hypoptopoma inexpectatum</i>			1					1
79	<i>Trichomycterus sp.</i>				1				1
80	<i>Astyanax cf. alleni</i>	1							1
81	<i>Pseudobunocephalus sp</i>		1						1

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No	Species	Gav	Tre	Sol	Lib	Sta. Ter	Zap	Her	Total
	Total no. of species by AM	770	553	885	499	676	497	578	4458

Photographs

For more illustrations about fish species, their hábitats and methods of information gathering please go to <https://drive.google.com/drive/folders/1qjN7YRtXMFaW-DEEMyxoMumMwO3m-ceB?usp=sharing>

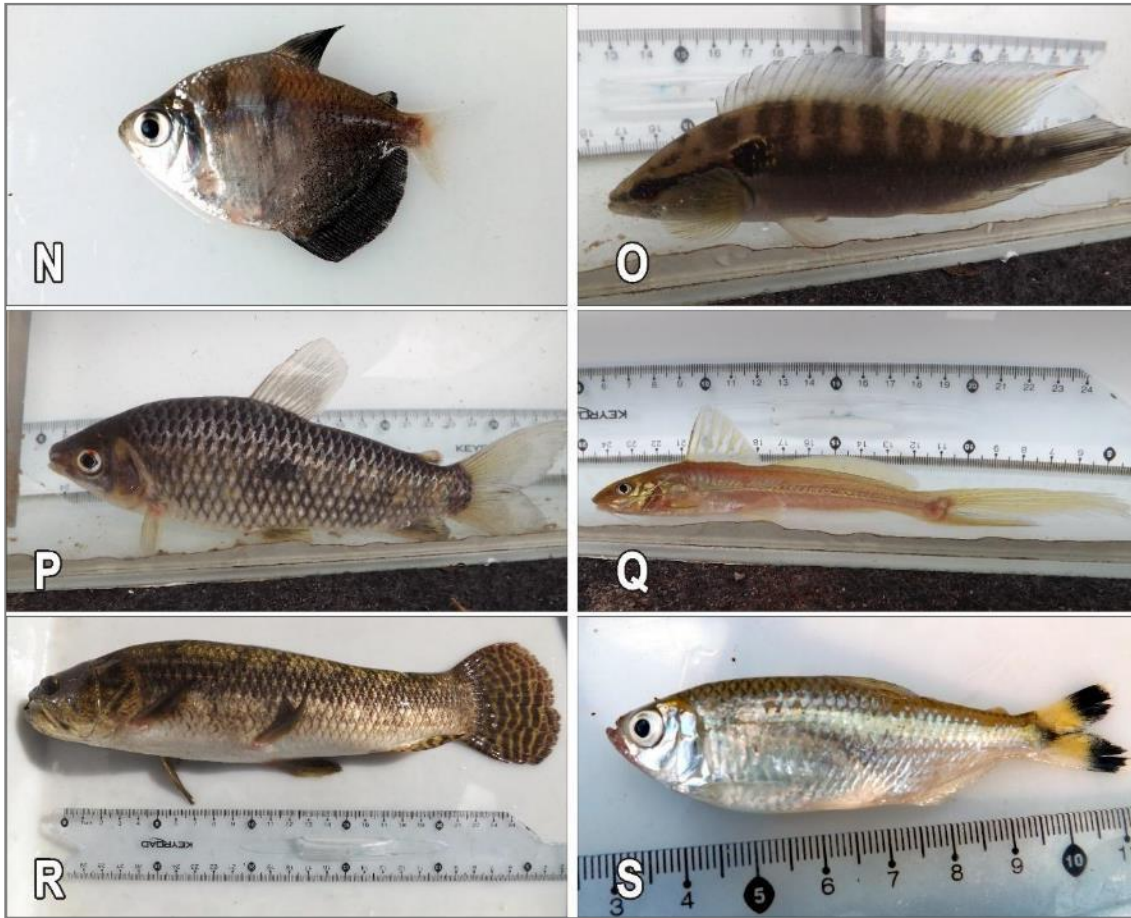
(Photos: Jimmy Emhart, Christian Baez & Oscar Feltes)



Ref.: A- *Astyanax lacustris*, B- *Parodon nasus*, C- *Characidium* sp., D- *Acestrorhynchus pantaneiro*, E- *Pyrrhulina australis*, F- *Psellogrammus kennedyi*.



Ref.: G- *Serrasalmus marginatus*, H- *Aphyocharax rathbuni*, I- *Eigenmannia trilineata*, J- *Brachyhypopomus gauderio*, K- *Gymnotus pantanal*, M- *Moenkhausia bonita*.



Ref.: N- *Gymnocorymbus ternetzi*, O- *Crenicichla lepidota*, P- *Megaleporinus obtusidens*, Q- *Pimelodella* sp., R- *Hoplias misionera*, S- *Moenkhausia dichroura* (especie más abundante).



Ref.: T- *Hyphessobrycon eques*, U- *Gymnogeophagus balzanii*. V- *Aphyocharax anisitsi*, W- *Platydoras armatulus*, X- *Rineloricaria aurata*, Y- *Pseudopimelodus* sp.



Ref.: Z- *Odontostilbe pequirá* (Mojarra), categorized as LC (Less concern at regional level by IUCN).



Ref.: A – *Rineloricaria lanceolata* (vieja), B – *Creinichla lepidota* (juanita), C - *Gymnorhamphichthys britskii* (morenita), D – *Loricaria* sp. (vieja), E – *Hypostomus* sp. (vieja), F - *Pimelodus gracilis* (mandí'i).



Ref.: G – *Microglanis carlae* (vieja de las piedras), H – *Pimelodu maculatus* (mandi'i), I - *Psellogrammus kennedyi* (mojarrita), J - *Paravandellia oxyptera* (sanguiuela), K - *Potamorrhaphis eigenmanni* (pez aguja, especie categorizada como (VU) Vulnerable según Resolución N° 1563/09 del MADES), L - *Megaleporinus obtusidens* (boga).

Photographs for depicting methodology and types of environments

(Jimmy Emhart, Christian Baez & Oscar Feltes)



Ref.: A a D – Metodology. E- Lentic environment. F- Lotic environment,

Herpetology

Transects and their plant communities (formations).

SECA = stands for transects developed during the dry season

Sampling area	Natural community /plant formation	Latitude	Longitude
Ea. Gavilán	BA	22°40'15.01"S	56°53'49.93"W
	BA	22°40'21.92"S	56°54'1.19"W
	BA	22°40'31.24"S	56°53'35.77"W
(Seca)	BA	22°40'29.41"S	56°53'36.44"W
	SI	22°40'10.18"S	56°53'58.14"W
(Seca)	SI	22°40'07.39"S	56°53'59,08"W
Ea. Hermosa	CD	22°31'13.67"S	56°56'47.06"W
	CD	22°31'13.39"S	56°56'45.09"W
	SA	22°25'1.21"S	56°52'5.96"W
	SA	22°24'47.74"S	56°52'11.08"W
	SI	22°24'31.06"S	56°52'32.06"W
	SI	22°28'24.55"S	56°59'7.03"W
	SI	22°27'46.94"S	56°57'35.14"W
	SI	22°27'40.68"S	56°57'30.85"W
	SI	22°27'16.61"S	56°55'21.58"W
	SI	22°27'15.57"S	56°55'19.98"W
	SI	22°24'39.76"S	56°52'32.87"W
	SI	22°24'36.94"S	56°52'24.33"W
	SI	22°24'47.40"S	56°53'24.56"W
Ea. Liberato	BA	22°39'21.02"S	56°51'32.35"W
	BR	22°40'9.95"S	56°49'37.84"W
	(Seca)	SI	22°39'33.19"S
Ea. Soledad	CC	22°39'48.70"S	57°12'6.28"W
	CD	22°36'33.49"S	57° 8'56.55"W
	SI	22°38'32.75"S	57°11'59.23"W
	(Seca)	SI	22°36'20.56"S
Ea. Sta. Teresa	BA	22°35'53.73"S	56°33'23.30"W
	BA	22°38'36.88"S	56°38'50.93"W
	BA	22°38'34.74"S	56°39'15.50"W

Sampling area	Natural community /plant formation	Latitude	Longitude
	BA	22°36'7.10"S	56°33'17.65"W
	BA	22°36'20.34"S	56°33'16.48"W
	SA	22°36'33.38"S	56°40'9.53"W
	SA	22°37'39.18"S	56°40'4.60"W
	SA	22°37'49.97"S	56°40'12.55"W
	SA	22°35'40.61"S	56°33'32.44"W
(Seca)	SA	22°37'27.5" S	56°40'03.1" W
	SI	22°38'43.67"S	56°38'52.43"W
	SI	22°38'37.69"S	56°39'8.92"W
	SI	22°35'37.40"S	56°33'37.61"W
	SI	22°35'30.43"S	56°33'42.80"W
	SI	22°36'25.66"S	56°33'10.40"W
	SI	22°35'55.95"S	56°33'17.92"W
(Seca)	SI	22°36'28.9" S	56°37'21.6" W
(Seca)	SI	22°37'18.2" S	56°40'00.9" W
(Seca)	SI	22°38'37.5" S	56°39'59.3" W
Ea. Trementina	BA	22°42'44.99"S	56°52'26.57"W
	BR	22°44'7.01"S	56°51'33.84"W
	SI	22°44'4.39"S	56°51'29.62"W
(Seca)	SI	22°44'14.60"S	56°51'25.83"W
(Seca)	SI	22°42'34.09"S	56°52'38.37"S
Ea. Zapallo	BA	22°29'3.06"S	56°32'42.55"W
	BR	22°29'1.01"S	56°32'51.43"W
	BR	22°29'2.36"S	56°32'57.44"W
	BR	22°30'41.21"S	56°36'50.56"W
(Seca)	BR	22°29'1.01"S	56°32'51.43"W
(Seca)	BR	22°29'03.7" S	56°32'40.3" W
	SA	22°25'41.52"S	56°32'38.69"W
	SA	22°25'39.35"S	56°32'35.37"W
	SA	22°25'30.84"S	56°32'41.27"W
	SA	22°25'32.33"S	56°32'49.59"W
(Seca)	SA	22°25'41.52"S	56°32'38.69"W
(Seca)	SA	22°32'01.2" S	56°31'39.8" W

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Sampling area	Natural community /plant formation	Latitude	Longitude
(Seca)	SA	22°32'12.0" S	56°36'44.9" W
	SI	22°31'19.58"S	56°36'35.62"W
	SI	22°31'37.90"S	56°36'19.41"W
	SI	22°30'54.72"S	56°36'31.64"W
	SI	22°31'4.02"S	56°36'32.89"W
	SI	22°30'41.69"S	56°36'44.93"W
(Seca)	SI	22°32'24.1" S	56°31'34.5" W
	talcal	22°30'48.29"S	56°36'31.60"W

List of amphibians and reptiles recorded

	Scientific name	Spanish common name	Conservation status - IUCN	Natural Community
ANFIBIOS				
Anura				
Bufoidea				
1	<i>Melanophryniscus fulvoguttatus</i>	Sapito	LC	BA,CD
2	<i>Rhinella diptycha</i>	Sapo	LC	CS,PP,SI
3	<i>Rhinella scitula</i>	Sapito del Cerrado	DD	BR
Hylidae				
4	<i>Dendropsophus cf. jimi</i>	Ranita	LC	SI
5	<i>Dendropsophus elianeae</i>	Ranita	LC	SI
6	<i>Dendropsophus minutus</i>	Ranita trepadora chica	LC	CS,SI,AA,VA
7	<i>Dendropsophus nanus</i>	Ranita trepadora enana	LC	BR,SA,SI,AA,CS,VA
8	<i>Boana punctata</i>	Rana verde	LC	SI, AA,VA
9	<i>Boana raniceps</i>	Rana arbórea	LC	SI,VA
10	<i>Phyllomedusa sauvagii</i>	Rana mono chaqueña	LC	BA
11	<i>Pithecopus azureus</i>	Ranita mono	DD	BA
12	<i>Pseudis platensis</i>	Rana boyadora grande	DD	AA,VA
13	<i>Scinax acuminatus</i>	Ranita hocicuda Chaqueña	LC	BR
14	<i>Scinax fuscomarginatus</i>	rana trepadora narigona	LC	CS,SI,AA,VA
15	<i>Scinax fuscovarius</i>	Rana trepadora común	LC	CD,SI
16	<i>Scinax nasicus</i>	Rana trepadora hocicuda	LC	BR,SI,SA,VA
17	<i>Trachycephalus typhonius</i>	Rana lechosa	LC	PP
Leptodactylidae				
18	<i>Adenomera diptyx</i>	Ranita marmolada	LC	BR,SI
19	<i>Leptodactylus bufonius</i>	Rana hornera	LC	AA
20	<i>Leptodactylus elenae</i>	Rana marmolada de labio blanco	LC	BR

	Scientific name	Spanish common name	Conservation status - IUCN	Natural Community
21	<i>Leptodactylus fuscus</i>	Rana silbadora	LC	BA, BR, SA, SI, VA
22	<i>Leptodactylus labyrinthicus</i>	Sapo toro laberintico	LC	BA
23	<i>Leptodactylus macrosternum</i>	Rana Chaqueña	LC	SI, BR, VA
24	<i>Leptodactylus podicipinus</i>	Rana de vientre moteado	LC	AR, BR, CD, SA, SI, VA
25	<i>Physalaemus albonotatus</i>	Ranita maulladora	LC	BA, BR, SI, SA, AR, VA
26	<i>Physalaemus biligonigerus</i>	Ranita llorona, ranita de cuatro ojos	LC	BA, BR, SI
27	<i>Physalaemus cuvieri</i>	Ranita Ladradora	LC	SI
28	<i>Physalaemus nattereri</i>	Rana cuatro ojos	LC	CS, SI, BR
29	<i>Pseudopaludicola ameghini</i>	Ranita	LC	AR, SI, BR, VA
30	<i>Pseudopaludicola boliviana</i>	Ranita	LC	BR, VA
Microhylidae				
31	<i>Chiasmocleis albopunctata</i>	Ranita	LC	SI, BA
32	<i>Dermatonotus muelleri</i>	Rana de cabeza chica, Tapa	LC	BA
33	<i>Elachistocleis matogrosso</i>	Ranita aceituna o panza amarilla	LC	SI
REPTILES				
Testudines				
Testudinidae				
34	<i>Chelonoidis carbonaria</i>	Tortuga de patas rojas	NE	BR, SI
Crocodylia				
Alligatoridae				
35	<i>Caiman yacare</i>	Yacaré	LC	AA, VA
36	<i>Caiman latirostris</i>	Yacaré Overo	LC	AA, SI, VA
Squamata-Sauria				
Tropiduridae				
37	<i>Ameiva ameiva</i>	Lagarto verde	LC	CD
38	<i>Ameivula aff. ocellifera</i>	Spix's Whiptail		SI
39	<i>Salvator merianae</i>	Lagarto overo	LC	BA, BR, CD
40	<i>Stenocercus caducus</i>	Lagartija	LC	SI
41	<i>Teius teyou</i>	Lagartija verde	LC	BA, BR, CC, CD, SI, SA
42	<i>Tropidurus lagunablanca</i>	Lagarto espinoso de Lagunablanca	NE	BA
43	<i>Tropidurus torquatus</i>	Lagarto trepador oriental	LC	
Gymnophthalmidae				
44	<i>Colobosaura modesta</i>	Teju'i	EN	BA
Mabuyidae				
45	<i>Manciola guaporicola</i>	Lagartija de cristal	LC	BA

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	Scientific name	Spanish common name	Conservation status - IUCN	Natural Community
46	<i>Notomabuya frenata</i>	Lagartija de cristal	LC	BR,CC,SA,SI,VA
Squamata-Serpientes				
Viperidae				
47	<i>Bothrops diporus</i>	Yarará Chica	LC	BR
48	<i>Bothrops matogrossensis</i>	Yarará	NE	CS,SA
Elapidae				
49	<i>Micrurus frontalis</i>	Serpiente de coral	LC	BR
Colubridae				
50	<i>Palusophis bifossatus</i>	Falsa yarara	LC	SI
Dipsadidae				
51	<i>Erythrolamprus miliaris</i>	Mboi pe	LC	BR
52	<i>Erythrolamprus poecilogyrus</i>	Ñandurire	LC	SA
53	<i>Erythrolamprus typhlus</i>	Culebra olivácea	LC	CD
54	<i>Helicops leopardinus</i>	Culebra de agua	LC	VA
55	<i>Lygophis dilepis</i>	Culebra listada	LC	BA
56	<i>Oxyrhopus guibeí</i>	Falsa coral	LC	SI
57	<i>Philodryas olfersii</i>	Culebra verde de Olfers	LC	SI
58	<i>Sibynomorphus ventrimaculatus</i>	Culebra duerme duerme	LC	CD
59	<i>Thamnodynastes hypoconia</i>	Falsa yarara	LC	SI

Photographic records for species of amphibians and reptiles

For more illustrations about species, hábitats and methods of informaiton gathering please visit <https://drive.google.com/drive/folders/12EE6f2UujSPKlqcCOYwul0FnkOmlZ7mb?usp=sharing>



Amphibians: A- *Boana raniceps*, B- *Trachycephalus typhonius*, C- *Scinax fuscomarginatus*, D- *S. nasicus* vocalizando y *Dendropsophus nanus*, E- *Pithecopus azureus*, F- *Phyllomedusa sauvagii*



Amphibians: G- *Pseudis platensis* H- *Dendropsophus elianae*, I- *D. aff. jimii*, J- *Boana punctata*, K- *L. fuscus*, L- *L. podicipinus*



Amphibians: M- *Leptodactylus macrosternum* N- *Leptodactylus elenae*, O- *Physalaemus natterei* en amplexo P. *albonotatus*, P- *P. albonotatus*, Q- *Pseudopaludicola ameghini*, R- *Pseudopaludicola ameghini* vocalizing



Amphibians: S- *Pseudopaludicola boliviana*, T- *Rhinella scitula*, U- *R. diptycha*, V- *Melanophryniscus fulvoguttatus*, W- *Elachistocleis Matogrosso*, X- *Dermatonotus muelleri*.



Reptiles: A- *Chelonoidis carbonaria* B- *Caiman latirostris*, C- *C. yacare* juvenil, D- *C. yacare*, E- *Teius teyou*, F- *Salvator merianae*



Reptiles: G- *Tropidurus lagunablanca*, H- *Manciola guaporicola*, I- *Colobosaura modesta*, J- *Ameivula aff. ocellifera*, K- *Stenocercus caducus*, L- *Notomabuya frenata*, M- *Tropidurus torquatus*, N- *Teius teyou oculto*.



Reptiles: O- *Bothrops matogrossensis*, P- *Bothrops diporus* Q- *Erythrolamprus miliaris*, R- *Erythrolamprus poecilogyrus*, S- *Thamnodynastes hypoconia*, T- *Sibynomorphus ventrimaculatus*, U- *Palusophys bifossatus*, V- *Erythrolamprus typhlus*.



W- Active search in bromeliads, X- active search in water bodies, Y- reptile prints, Z- active Search for amphibians and reptiles in refuges.

Water bodies visited during night surveys (Humedal = Wetland; Laguna = Lagoon; Tajamar = Artificial pond)

Área de muestreo	Wáter body	Latitude	Longitude
Ea. Hermosa	Humedal	22°27'24.12"S	56°53'4.80"W
Ea. Hermosa	Humedal	22°26'48.70"S	56°53'16.16"W
Ea. Gavilán	Laguna	22°36'38.20"S	56°54'6.00"W
Ea. Gavilán	Laguna	22°37'38.65"S	56°54'8.32"W
Ea. Gavilán	Tajamar	22°40'11.79"S	56°53'56.73"W
Ea. Hermosa	laguna	22°25'12.24"S	56°55'45.98"W
Ea. Hermosa	tajamar	22°27'23.35"S	56°53'29.85"W
Ea. Hermosa	tajamar	22°28'9.03"S	56°52'50.51"W
Ea. Hermosa	tajamar	22°24'41.23"S	56°54'36.39"W
Ea. Sta. Teresa	estanque	22°37'21.30"S	56°35'12.80"W
Ea. Sta. Teresa	estanque	22°37'46.51"S	56°40'7.23"W
Ea. Sta. Teresa	tajamar	22°38'37.42"S	56°39'28.46"W
Ea. Sta. Teresa	tajamar	22°38'24.75"S	56°40'10.77"W
Ea. Sta. Teresa	tajamar	22°38'22.99"S	56°38'15.13"W
Ea. Sta. Teresa	tajamar	22°38'40.93"S	56°39'20.56"W
Ea. Sta. Teresa	tajamar	22°38'7.04"S	56°38'14.25"W
Ea. Sta. Teresa	humedal	22°35'33.96"S	56°36'49.15"W
Ea. Trementina	laguna	22°42'41.51"S	56°52'30.86"W
Ea. Trementina	laguna	22°44'37.65"S	56°50'32.14"W
Ea. Zapallo	estanque	22°33'4.99"S	56°31'35.21"W
Ea. Zapallo	estanque	22°27'57.97"S	56°33'33.96"W
Ea. Zapallo	humedal	22°29'51.05"S	56°32'4.97"W
Ea. Zapallo	humedal	22°31'4.20"S	56°31'40.70"W
Ea. Zapallo	humedal	22°31'11.79"S	56°31'44.34"W
Ea. Zapallo	tajamar	22°33'8.38"S	56°37'9.50"W
Ea. Liberato	tajamar	22°39'05.7"S	56°52'10.4"W

Ornithology

Sampling sites for the ornithological sampling and natural communities

The ornithological sampling areas included several sites, the sites correspond to natural communities. Natural communities were identified in order to assess the richness and abundance of birds. In all the sampling areas, Riparian Forests (BR) were evaluated, in three of them Degraded High Forests (BA), while Floodable Savanna (SI), High Savanna (SA) and Aquatic Vegetation (VA), in addition to the Cerrado phytofisionomies, such as Campo Cerrado (CC) and Cerradón (CD).

Sampling areas	Natural community / plant formation	Coordinates
Gavilán	BA Bosque Alto degradado	22°40'20,3"S; 56°53'44,7"W
	BR Bosque ribereño o marginal	22°40'03,1"S; 56°53'44,3"W
	SI Sabana inundable (costado arroyo sin nombre)	22°40'15"S; 56°54'00"W
Trementina	VA Vegetación acuática y palustre	22°43'54,7"S; 56°54'30,4"W
	BA Bosque Alto degradado	22°42'56.65"S; 56°52'14.20"W
	BR Bosque ribereño o marginal	22°43'56,1"S; 56°51'14,9"W
Soledad	CC Campo cerrado	22°39'46,7"S; 57°12'11,2"W
	BR Bosque ribereño o marginal	22°39'40,0"S; 57°12'04,0"W
	SI Sabana inundable	22°38'31,9"S; 57°11'45,4"W
	CD Cerradón	22°36'35,6"S; 57°08'59,2"W
San Liberato	BR Bosque ribereño o marginal	22°40'05,9"S; 56°49'40,1"W
	BA Bosque Alto Degradado	22°39'17,0"S; 56°51'35,1"W
Ea. Hermosa	CD Cerradón	22°31'13.6"S; 56°56'47.0"W
	CD Cerradón	22°31'13.39"S; 56°56'45.09"W
	SA Sabana alta	22°25'1.21" S; 56°52'5.96"W
	SA Sabana alta	22°24'47.74"S; 56°52'11.08"W
	SI Sabana inundable	22°24'31.06"S; 56°52'32.06"W
	SI Sabana inundable	22°28'24.55"S; 56°59'7.03"W
	SI Sabana inundable	22°27'46.94"S; 56°57'35.14"W
	SI Sabana inundable	22°27'40.68"S; 56°57'30.85"W
	SI Sabana inundable	22°27'16.61"S; 56°55'21.58"W
	SI Sabana inundable	22°27'15.57"S; 56°55'19.98"W
	SI Sabana inundable	22°24'39.76"S; 56°52'32.87"W
	SI Sabana inundable	22°24'36.94"S; 56°52'24.33"W
Ea. Zapallo	BA Bosque Alto Degradado	22°29'3.06"S; 56°32'42.55"W
	BR Bosque ribereño o marginal	22°29'1.01"S; 56°32'51.43"W
	BR Bosque ribereño o marginal	22°29'2.36"S; 56°32'57.44"W

Sampling areas		Natural community / plant formation	Coordinates
	BR	Bosque ribereño o marginal	22°30'41.21"S; 56°36'50.56"W
	SA	Sabana alta	22°25'41.52"S; 56°32'38.69"W
	SA	Sabana alta	22°25'39.35"S; 56°32'35.37"W
	SA	Sabana alta	22°25'30.84"S; 56°32'41.27"W
	SA	Sabana alta	22°25'32.33"S; 56°32'49.59"W
	SI	Sabana inundable	22°31'19.58"S; 56°36'35.62"W
	SI	Sabana inundable	22°31'37.90"S; 56°36'19.41"W
	SI	Sabana inundable	22°30'54.72"S; 56°36'31.64"W
	SI	Sabana inundable	22°31'4.02"S; 56°36'32.89"W
	SI	Sabana inundable	22°30'41.69"S; 56°36'44.93"W
Ea. Sta. Teresa	BA	Bosque Alto Degradado	22°35'53.73"S; 56°33'23.30"W
	BA	Bosque Alto Degradado	22°38'36.88"S; 56°38'50.93"W
	BA	Bosque Alto Degradado	22°38'34.74"S; 56°39'15.50"W
	BA	Bosque Alto Degradado	22°36'7.10"S; 56°33'17.65"W
	BA	Bosque Alto Degradado	22°36'20.34"S; 56°33'16.48"W
	SA	Sabana alta	22°36'33.38"S; 56°40'9.53"W
	SA	Sabana alta	22°37'39.18"S; 56°40'4.60"W
	SA	Sabana alta	22°37'49.97"S; 56°40'12.55"W
	SA	Sabana alta	22°35'40.61"S; 56°33'32.44"W
	SI	Sabana inundable	22°38'43.67"S; 56°38'52.43"W
	SI	Sabana inundable	22°38'37.69"S; 56°39'8.92"W
	SI	Sabana inundable	22°35'37.40"S; 56°33'37.61"W
	SI	Sabana inundable	22°35'30.43"S; 56°33'42.80"W
	SI	Sabana inundable	22°36'25.66"S; 56°33'10.40"W
SI	Sabana inundable	22°35'55.95"S; 56°33'17.92"W	

List of species recorded

No	Scientific names	Common name in Spanish	IUCN Conservation Status	Natural Community								
				BA	BR	SI	SA	VA	CC	CS	CD	AA
1	<i>Rhea americana</i>	Ñandu	NT			X	X		X			
2	<i>Crypturellus undulatus</i>	Tataupá listado	LC	X	X	X		X			X	
3	<i>Crypturellus parvirostris</i>	Tataupá chico	LC	X	X	X	X	X				
4	<i>Crypturellus tataupa</i>	Tataupá común	LC		X	X		X	X		X	
5	<i>Rhynchotus rufescens</i>	Martineta	LC	X	X			X	X			
6	<i>Nothura maculosa</i>	Perdiz chica	LC		X	X	X					

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No	Scientific names	Common name in Spanish	IUCN Conservation	Natural Community																
7	<i>Chauna torquata</i>	Chajá	LC				X		X											
8	<i>Dendrocygna viduata</i>	Pato silbón cara blanca	LC				X		X											
9	<i>Cairina moschata</i>	Bragado	LC				X		X											
10	<i>Amazonetta brasiliensis</i>	Alita azul	LC				X	X	X											
11	<i>Ortalis canicollis</i>	Charata	LC	X	X			X												
12	<i>Pipile cumanensis grayi</i>	Pava campanilla	NT	X			X												X	
13	<i>Crax fasciolata</i>	Pava pintada	VU				X													
14	<i>Tachybaptus dominicus</i>	Macacito gris	LC										X							
15	<i>Patagioenas cayennensis</i>	Paloma colorada	LC	X	X	X	X	X											X	
16	<i>Patagioenas picazuro</i>	Paloma turca	LC	X	X	X	X			X									X	
17	<i>Columbina talpacoti</i>	Tortolita colorada	LC	X	X	X	X	X	X	X	X									
18	<i>Columbina squammata</i>	Palomita escamada	LC	X	X	X	X			X										
19	<i>Columbina picui</i>	Tortolita picuí	LC	X	X	X	X													
20	<i>Leptotila verreauxi</i>	Yerutí común	LC	X	X	X	X			X									X	
21	<i>Zenaida auriculata</i>	Torcaza	LC	X	X	X	X			X										
22	<i>Guira guira</i>	Piririta	LC	X	X	X	X			X										
23	<i>Crotophaga major</i>	Anó grande	LC	X	X															
24	<i>Crotophaga ani</i>	Anó chico	LC	X	X	X	X	X	X	X	X								X	
25	<i>Tapera naevia</i>	Chochí	LC				X	X												
26	<i>Piaya cayana</i>	Tingazú	LC																X	
27	<i>Nyctibius griseus</i>	Urutaú común	LC	X																
28	<i>Chordeiles nacunda</i>	Ñacundá	LC				X	X												
29	<i>Lurocalis semitorquatus</i>	Añapero castaño	LC	X																
30	<i>Hydropsalis torquata</i>	Atajacaminos tijera	LC																	
31	<i>Nyctidromus albicollis</i>	Curiango	LC	X																
32	<i>Setopagis parvula</i>	Atajacaminos chico	LC	X																
33	<i>Antrastomus rufus</i>	Atajacaminos colorado	LC	X																
34	<i>Chaetura meridionalis</i>	Vencejo de tormenta	LC																	X
35	<i>Polytmus guainumbi</i>	Picaflor de antifaz	LC															X		X
36	<i>Heliomaster furcifer</i>	Picaflor de barbijo	LC																	
37	<i>Thalurania furcata</i>	Picaflor zafiro	LC	X																
38	<i>Anthracothorax nigricollis</i>	Picaflor vientre negro	LC				X	X												
39	<i>Chlorostilbon lucidus</i>	Picaflor verde	LC	X				X	X											
40	<i>Hylocharis chrysura</i>	Picaflor bronceado	LC				X	X						X					X	
41	<i>Eupetionema macroura</i>	Picaflor tijereta	LC				X													
42	<i>Aramus guarauna</i>	Carau	LC				X													
43	<i>Mustelirallus albicollis</i>	Burrito grande	LC					X										X		
44	<i>Aramides ypecaha</i>	Gallineta de agua	LC															X		
45	<i>Aramides cajaneus</i>	Chiricoe	LC				X													
46	<i>Laterallus melanophaius</i>	Burrito silbón	LC															X		
47	<i>Gallinula galeata</i>	Polla negra	LC				X			X										
48	<i>Porphyrio flavirostris</i>	Polla celeste	LC					X												
49	<i>Porphyrio martinica</i>	Polla azul	LC															X		
50	<i>Himantopus mexicanus</i>	Tero real	LC															X		

No	Scientific names	Common name in Spanish	IUCN Conservation	Natural Community																
51	<i>Vanellus chilensis</i>	Tero tero	LC		X	X	X	X												
52	<i>Tringa solitaria</i>	Pitotoi solitario	LC			X														
53	<i>Jacana jacana</i>	Jacana	LC		X	X	X	X												
54	<i>Rynchops niger</i>	Rayador	LC					X												
55	<i>Jabiru mycteria</i>	Yabirú	LC			X	X													
56	<i>Ciconia maguari</i>	Cigüeña americana	LC			X		X												
57	<i>Mycteria americana</i>	Tuyuyú	LC			X		X												
58	<i>Anhinga anhinga</i>	Aninga	LC		X			X												
59	<i>Tigrisoma lineatum</i>	Hocó colorado	LC					X												
60	<i>Ardea cocoi</i>	Garza mora	LC					X												
61	<i>Ardea alba</i>	Garza blanca	LC		X		X	X												
62	<i>Egretta thula</i>	Garcita blanca	LC					X												
63	<i>Bubulcus ibis</i>	Garcita bueyera	LC				X													
64	<i>Butorides striata</i>	Garcita azulada	LC		X		X	X												
65	<i>Syrigma sibilatrix</i>	Flauta del sol	LC			X	X	X												
66	<i>Nycticorax nycticorax</i>	Garza bruja	LC			X	X	X												
67	<i>Phimosus infuscatus</i>	Cuervillo cara pelada	LC		X	X		X												
68	<i>Theristicus caerulescens</i>	Bandurria mora	LC			X		X												
69	<i>Theristicus caudatus</i>	Bandurria baya	LC		X	X													X	
70	<i>Platalea ajaja</i>	Espátula rosada	LC			X		X												
71	<i>Sarcoramphus papa</i>	Cuervo real	LC	X	X															
72	<i>Coragyps atratus</i>	Cuervo negro	LC	X	X	X	X			X										
73	<i>Cathartes aura</i>	Cuervo cabeza roja	LC	X	X	X	X	X												
74	<i>Cathartes burrovianus</i>	Cuervo cabeza amarilla	LC			X	X			X										
75	<i>Leptodon cayanensis</i>	Milano cabeza gris	LC	X		X														
76	<i>Rostrhamus sociabilis</i>	Caracolero	LC					X												
77	<i>Ictinia plumbea</i>	Milano plumizo	LC	X	X	X														
78	<i>Parabuteo unicinctus</i>	Gavilán mixto	LC																	
79	<i>Geranospiza caerulescens</i>	Gavilán patas largas	LC	X	X															
80	<i>Buteogallus meridionalis</i>	Aguilucho colorado	LC		X	X	X													
81	<i>Buteogallus urubitinga</i>	Águila negra	LC		X															
82	<i>Rupornis magnirostris</i>	Taguató común	LC	X	X	X	X	X											X	
83	<i>Megascops choliba</i>	Lechucita común	LC	X																
84	<i>Glaucidium brasilianum</i>	Caburé	LC		X															
85	<i>Athene cunicularia</i>	Lechucita vizcachera	LC	X		X	X													
86	<i>Asio flammeus</i>	Lechuzón de campo	LC					X												
87	<i>Trogon surrucura</i>	Surucua común	LC	X	X					X										
88	<i>Trogon curucui</i>	Surucúa aurora	LC	X	X	X		X											X	
89	<i>Momotus momota</i>	Burgo	LC	X	X															
90	<i>Megaceryle torquata</i>	Martín pescador grande	LC	X	X															
91	<i>Chloroceryle americana</i>	Martín pescador chico	LC		X															
92	<i>Chloroceryle amazona</i>	Martín pescador mediano	LC		X															
93	<i>Nystalus chacuru</i>	Chacurú cara negra	LC	X		X	X	X	X											

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94	<i>Notharchus swainsonii</i>	Chacurú grande	LC	X																
95	<i>Nystalus maculatus</i>	Durmilí	LC	X	X	X		X	X											X
96	<i>Pteroglossus castanotis</i>	Arasarí fajado	LC	X	X															X
97	<i>Ramphastos toco</i>	Tucán grande	LC	X	X	X	X													X
98	<i>Picumnus cirratus</i>	Carpinterito común	LC	X	X	X	X													
99	<i>Melanerpes candidus</i>	Carpintero blanco	LC	X	X	X	X													
100	<i>Dryobates passerinus</i>	Carpinterito oliváceo	LC	X		X	X													
101	<i>Dryobates mixtus</i>	Carpintero bataraz																		X
102	<i>Campephilus melanoleucos</i>	Carpintero garganta negra	LC	X																
103	<i>Dryocopus lineatus</i>	Carpintero garganta estriada	LC	X									X							X
104	<i>Celeus lugubris</i>	Carpintero copete pajizo	LC		X															
105	<i>Piculus chrysochloros</i>	Carpintero dorado	LC		X															
106	<i>Colaptes melanochloros</i>	Carpintero real	LC	X		X	X						X							
107	<i>Colaptes campestris</i>	Carpintero campestre	LC		X	X	X						X							
108	<i>Cariama cristata</i>	Saría patas rojas	LC		X	X	X						X							X
109	<i>Micrastur semitorquatus</i>	Halcón montés	LC	X																
110	<i>Caracara plancus</i>	Carancho	LC	X	X	X	X						X							
111	<i>Milvago chimachima</i>	Chimachima	LC										X							X
112	<i>Herpetotheres cachinnans</i>	Guaicurú	LC										X							
113	<i>Falco peregrinus</i>	Halcon peregrino	LC		X															
114	<i>Falco femoralis</i>	Halcón plumizo	LC										X							
115	<i>Falco sparverius</i>	Halconcito colorado	LC		X	X	X	X	X	X										
116	<i>Myiopsitta monachus</i>	Cotorrita	LC	X	X	X	X													
117	<i>Brotogeris chiriri</i>	Catita chiriri	LC	X	X	X	X						X							X
118	<i>Pionus maximiliani</i>	Loro choclero	LC	X		X							X							X
119	<i>Alipiopsitta xanthops</i>	Loro cara amarilla	NT										X							
120	<i>Amazona aestiva</i>	Loro hablador	NT	X	X	X	X						X							X
121	<i>Amazona amazonica</i>	Loro de ala naranja	LC										X							X
122	<i>Forpus xanthopterygius</i>	Catita viuda	LC	X		X	X						X							
123	<i>Pyrrhura devillei</i>	Chiripepé ala anaranjada	NT	X	X	X	X													
124	<i>Pyrrhura frontalis</i>	Chiripepé cabeza verde	LC	X	X	X	X													X
125	<i>Eupsittula aurea</i>	Maracaná frente naranja	LC		X	X	X						X							X
126	<i>Aratinga nenday</i>	Ñanday	LC										X							X
127	<i>Ara chloropterus</i>	Guacamayo rojo	LC		X															
128	<i>Psittacara leucophthalmus</i>	Maracaná ala roja	LC	X	X	X	X	X	X	X										X
129	<i>Taraba major</i>	Chororó	LC	X	X		X	X	X											
130	<i>Thamnophilus doliatus</i>	Batará rayado	LC	X	X	X	X						X							
131	<i>Thamnophilus caerulescens</i>	Batará plumizo	LC	X	X	X	X						X							X
132	<i>Formicivora rufa</i>	Batará colorado	LC										X							X
133	<i>Sittasomus griseicapillus</i>	Guirí	LC		X															
134	<i>Dendrocolaptes picumnus</i>	Trepador colorado	LC	X																

No	Scientific names	Common name in Spanish	IUCN Conservation	Natural Community										
135	<i>Dendrocolaptes platyrostris</i>	Trepador oscuro	LC		X					X		X		
136	<i>Campylorhamphus trochilirostris</i>	Picapalo colorado	LC		X									
137	<i>Xiphocolaptes major</i>	Trepador gigante	LC		X									
138	<i>Lepidocolaptes angustirostris</i>	Chincherito chico	LC	X	X	X	X	X	X	X		X		
139	<i>Furnarius rufus</i>	Hornero	LC	X	X	X	X			X		X		
140	<i>Phacellodomus rufifrons</i>	Espinero frente rojiza	LC	X	X	X	X			X				
141	<i>Phacellodomus ruber</i>	Espinero grande	LC			X	X							
142	<i>Anumbius annumbi</i>	Leñatero	LC				X							
143	<i>Certhiaxis cinnamomeus</i>	Curutié colorado	LC		X	X	X							
144	<i>Schoeniophylax phryganophilus</i>	Chotoy	LC		X	X	X			X				
145	<i>Synallaxis frontalis</i>	Pijuí frente gris	LC		X									
146	<i>Tityra inquisitor</i>	Tueré chico	LC	X										
147	<i>Tityra cayana</i>	Tueré grande	LC	X	X									
148	<i>Tityra semifasciata</i>	Tueré enmascarado	LC	X										
149	<i>Pachyramphus viridis</i>	Anambé verdoso	LC										X	
150	<i>Pachyramphus validus</i>	Anambé grande	LC		X									
151	<i>Leptopogon amaurocephalus</i>	Mosqueta corona parda	LC	X	X			X						
152	<i>Hemitriccus margaritaceiventer</i>	Mosqueta ojo dorado	LC	X	X	X	X			X		X		
153	<i>Cnemotriccus fuscatus</i>	Mosqueta ceja blanca	LC		X									
154	<i>Tolmomyias sulphurescens</i>	Picochato grande	LC		X								X	
155	<i>Camptostoma obsoletum</i>	Piojito silbón	LC	X	X	X	X			X				
156	<i>Myiopagis caniceps</i>	Fiofío ceniciento	LC											
157	<i>Myiopagis viridicata</i>	Fiofío corona dorada	LC	X	X									
158	<i>Elaenia parvirostris</i>	Fiofío pico corto	LC			X								
159	<i>Elaenia albiceps</i>	Fiofío silbón	LC	X										
160	<i>Elaenia flavogaster</i>	Fiofío copetón	LC	X	X	X	X	X	X	X		X		
161	<i>Elaenia spectabilis</i>	Fiofío grande	LC			X	X			X		X		
162	<i>Lathrotriccus euleri</i>	Mosqueta parda	LC	X										
163	<i>Pyrocephalus rubinus</i>	Churrinche	LC				X							
164	<i>Suiriri suiriri</i>	Suiriri vientre blanco	LC		X								X	
165	<i>Serpophaga subcristata</i>	Turí turí	LC	X										
166	<i>Serpophaga griseiceps</i>	Piojito trinador	LC	X										
167	<i>Myiophobus fasciatus</i>	Mosqueta estriada	LC	X										
168	<i>Xolmis cinereus</i>	Monjita gris	LC			X	X						X	
169	<i>Xolmis velatus</i>	Monjita velada	LC	X		X	X	X					X	
170	<i>Xolmis irupero</i>	Monjita blanca	LC		X		X							
171	<i>Gubernetes yetapa</i>	Yetapá grande	LC	X		X								
172	<i>Casiornis rufus</i>	Suiriri castaño	LC	X	X	X								
173	<i>Inezia inornata</i>	Piojito picudo	LC	X	X									
174	<i>Myiarchus tyrannulus</i>	Burlisto cola castaña	LC	X	X	X	X			X				
175	<i>Myiarchus swainsoni</i>	Burlisto pico canela	LC		X	X	X			X				
176	<i>Myiarchus ferox</i>	Burlisto pico negro	LC	X	X	X	X			X		X		

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177	<i>Machetornis rixosa</i>	Caballerizo	LC		X	X	X	X	X											
178	<i>Pitangus sulphuratus</i>	Pitogüé común	LC	X	X	X	X			X										X
179	<i>Megarynchus pitangua</i>	Pitanguá	LC	X	X	X				X										X
180	<i>Myiozetetes similis</i>	Pitogüé mediano	LC	X	X	X														
181	<i>Myiozetetes cayanensis</i>	Pitogüé mediano de alas rufas	LC	X	X			X												
182	<i>Euscarthmus meloryphus</i>	Barullero	LC	X																
183	<i>Myiodynastes maculatus</i>	Pitogüé rayado	LC		X			X												X
184	<i>Legatus leucophaeus</i>	Tuquito chico	LC		X	X	X			X										X
185	<i>Empidonomus aurantioatrocristatus</i>	Tuquito gris	LC	X	X															
186	<i>Tyrannus melancholicus</i>	Suiriri real	LC	X	X	X	X			X										
187	<i>Tyrannus savana</i>	Tijereta	LC							X										
188	<i>Sirystes sibilator</i>	Suirirí silbón	LC	X	X	X				X										
189	<i>Xenopsaris albinucha</i>	Tijerilla	LC		X															
190	<i>Himenops perspicillatus</i>	Pico de plata	LC							X										
191	<i>Arundinicola leucocephala</i>	Lavandera	LC				X			X										
192	<i>Pipra fasciicauda</i>	Bailarín naranja	LC							X										
193	<i>Cyclarhis gujanensis</i>	Juan chiviro	LC	X	X	X	X			X										X
194	<i>Vireo chivi</i>	Chiví común	LC	X	X	X				X										X
195	<i>Cyanocorax cyanomelas</i>	Urraca morada	LC	X	X	X	X			X										X
196	<i>Cyanocorax chrysops</i>	Urraca común	LC	X	X	X	X	X	X	X										X
197	<i>Donacobius atricapilla</i>	Angú	LC							X										
198	<i>Stelgidopteryx ruficollis</i>	Golondrina ribereña	LC				X	X												
199	<i>Alopocheilidon fucata</i>	Golondrina cabeza rojiza	LC			X														
200	<i>Progne chalybea</i>	Golondrina doméstica	LC				X	X												
201	<i>Progne tapera</i>	Golondrina parda	LC				X	X	X											
202	<i>Poliophtila dumicola</i>	Tacuárita azul	LC	X	X	X				X										
203	<i>Troglodytes aedon</i>	Ratona común	LC	X	X	X														
204	<i>Campylorhynchus turdinus</i>	Ratona grande	LC	X	X	X	X			X										X
205	<i>Mimus triurus</i>	Calandria real	LC							X									X	X
206	<i>Mimus saturninus</i>	Calandria grande	LC	X	X	X	X			X										
207	<i>Turdus leucomelas</i>	Zorzal alas canelas	LC	X	X	X	X			X										X
208	<i>Turdus rufiventris</i>	Zorzal colorado	LC	X	X															
209	<i>Turdus amaurochalinus</i>	Zorzal mandioca	LC																	X
210	<i>Passer domesticus</i>	Gorrión	LC	X																
211	<i>Anthus lutescens</i>	Cachirla chica	LC	X			X	X												
212	<i>Euphonia chlorotica</i>	Viví	LC	X	X	X	X	X	X	X										X
213	<i>Spinus magellanicus</i>	Cabecita negra	LC				X			X										
214	<i>Ammodramus humeralis</i>	Cachilo ceja amarilla	LC			X	X	X		X										
215	<i>Zonotrichia capensis</i>	Bendito Sea	LC	X	X	X	X													
216	<i>Cacicus solitarius</i>	Boyero negro	LC				X													
217	<i>Cacicus chrysopterus</i>	Boyero ala amarilla	LC	X	X	X	X			X										X
218	<i>Cacicus haemorrhous</i>	Boyero cacique	LC	X	X	X	X													

No	Scientific names	Common name in Spanish	IUCN Conservation	Natural Community										
219	<i>Icterus pyrrhopterus</i>	Boyerito	LC	X	X	X	X		X		X			
220	<i>Molothrus rufoaxillaris</i>	Tordo pico corto	LC		X				X					
221	<i>Molothrus bonariensis</i>	Tordo renegrado	LC					X						
222	<i>Molothrus oryzivorus</i>	Tordo gigante	LC		X									
223	<i>Gnorimopsar chopi</i>	Chopí	LC		X	X	X		X		X			
224	<i>Agelaioides badius</i>	Tordo músico	LC			X								
225	<i>Leistes superciliaris</i>	Pecho colorado	LC		X									
226	<i>Pseudoleistes guirahuro</i>	Chopí estero	LC		X	X								
227	<i>Setophaga pitiayumi</i>	Pitiayumí	LC	X	X									
228	<i>Myiothlypis flaveola</i>	Arañero amarillo	LC	X	X		X						X	
229	<i>Basileuterus culicivorus</i>	Arañero coronado	LC		X									
230	<i>Geothlypis aequinoctialis</i>	Arañero cara negra	LC	X				X						
231	<i>Piranga flava</i>	Fueguero rojo	LC		X									
232	<i>Cyanoloxia brissonii</i>	Reinamora grande	LC						X					
233	<i>Paroaria coronata</i>	Cardenal	LC				X		X					
234	<i>Paroaria capitata</i>	Cardenilla	LC		X									
235	<i>Nemosia pileata</i>	Frutero cabeza negra	LC	X	X	X								
236	<i>Eucometis penicillata</i>	Frutero amarillo	LC		X									
237	<i>Hemithraupis guira</i>	Saira dorada	LC		X									
238	<i>Thraupis palmarum</i>	Azulejo de palmar	LC											X
239	<i>Tachyphonus rufus</i>	Frutero negro	LC	X	X	X	X		X					
240	<i>Thraupis sayaca</i>	Chogüí	LC	X	X	X	X		X		X			
241	<i>Stilpnia cayana</i>	Saira pecho negro	LC	X										
242	<i>Tersina viridis</i>	Tersina	LC	X	X									
243	<i>Dacnis cayana</i>	Saí azul	LC	X									X	
244	<i>Conirostrum speciosum</i>	Mielerito azul	LC		X			X						
245	<i>Sicalis flaveola</i>	Canario paraguay	LC	X				X						
246	<i>Sicalis luteola</i>	Chipíu	LC			X								
247	<i>Emberizoides herbicola</i>	Coludo grande	LC			X								
248	<i>Emberizoides ypiranganus</i>	Coludo chico	LC			X	X							
249	<i>Embernagra platensis</i>	Verdón	LC			X		X						
250	<i>Volatinia jacarina</i>	Volatinero	LC			X								
251	<i>Sporophila leucoptera</i>	Corbatita blanco	LC			X								
252	<i>Sporophila pileata</i>	Capuchino boina negra	LC			X								
253	<i>Sporophila plumbea</i>	Corbatita plumizo	LC				X							
254	<i>Sporophila angolensis</i>	Curió	LC		X	X	X							
255	<i>Sporophila caerulescens</i>	Corbatita común	LC	X	X	X		X						
256	<i>Thlypopsis sordida</i>	Fruterito jilguero	LC	X	X									
257	<i>Coryphospingus cucullatus</i>	Brasita de fuego	LC	X	X	X			X		X		X	
258	<i>Saltatricula atricollis</i>	Pepitero de corbata	LC		X		X		X					
259	<i>Saltator similis</i>	Pepitero verdoso	LC	X										
260	<i>Saltator coerulescens</i>	Pepitero gris	LC	X	X	X								

BA: High forest; BR: Riparian forest; SA: High savanna; SI: floodable savanna; CC: cerrado fields; CD: Cerradón; VA: aquatic vegetation.

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Taxonomic list of bird species

N°	Scientific names	Common name in Spanish	IUCN conservation status	Natural community					
AVES									
Rheiformes									
Rheidae									
1	<i>Rhea americana</i>	Ñandu	NT	SI	SA	CC			
Tinamiformes									
Tinamidae									
2	<i>Crypturellus undulatus</i>	Tataupá listado	LC	BA	BR	SI	VA	CD	
3	<i>Crypturellus parvirostris</i>	Tataupá chico	LC	BA	BR	SI	SA	VA	
4	<i>Crypturellus tataupa</i>	Tataupá común	LC		BR	SI	VA	CC	CD
5	<i>Rhynchotus rufescens</i>	Martineta	LC	BA	BR		VA	CC	
6	<i>Nothura maculosa</i>	Perdiz chica	LC		BR	SI	SA		
Anseriformes									
Anhimidae									
7	<i>Chauna torquata</i>	Chajá	LC		SI	VA			
Anatidae									
8	<i>Dendrocygna viduata</i>	Pato silbón cara blanca	LC		SI	VA			
9	<i>Cairina moschata</i>	Bragado	LC		SI	VA			
10	<i>Amazonetta brasiliensis</i>	Alita azul	LC		SI	SA	VA		
Galliformes									
Cracidae									
11	<i>Ortalis canicollis</i>	Charata	LC	BA	BR	SA			
12	<i>Pipile cumanensis grayi</i>	Pava campanilla	NT	BA	SI				CD
13	<i>Crax fasciolata</i>	Pava pintada	VU		BR				
Podicipediformes									
Podicipedidae									
14	<i>Tachybaptus dominicus</i>	Macacito gris	LC				VA		
Columbiformes									
Columbidae									
15	<i>Patagioenas cayennensis</i>	Paloma colorada	LC	BA	BR	SI	SA	VA	CD
16	<i>Patagioenas picazuro</i>	Paloma turca	LC	BA	BR	SI	SA	CC	CD
17	<i>Columbina talpacoti</i>	Tortolita colorada	LC	BA	BR	SI	SA	VA	CC
18	<i>Columbina squammata</i>	Palomita escamada	LC	BA	BR	SI	SA	CC	
19	<i>Columbina picui</i>	Tortolita picuí	LC	BA	BR	SI	SA		
20	<i>Leptotila verreauxi</i>	Yerutí común	LC	BA	BR	SI	SA	CC	CD
21	<i>Zenaida auriculata</i>	Torcaza	LC	BA	BR	SI	SA	CC	
Cuculiformes									
Cuculidae									
22	<i>Guira guira</i>	Piririta	LC	BA	BR	SI	SA	CC	
23	<i>Crotophaga major</i>	Anó grande	LC	BA	BR				
24	<i>Crotophaga ani</i>	Anó chico	LC	BA	BR	SI	SA	VA	CC
25	<i>Tapera naevia</i>	Chochí	LC		BR	SI			
26	<i>Piaya cayana</i>	Tingazú	LC						CC
Nyctibiiformes									
Nyctibiidae									
27	<i>Nyctibius griseus</i>	Urutaú común	LC	BA					
Caprimulgiformes									
Caprimulgidae									
28	<i>Chordeiles nacunda</i>	Ñacundá	LC		SI	SA			
29	<i>Lurocalis semitorquatus</i>	Añapero castaño	LC	BA					
30	<i>Hydropsalis torquata</i>	Atajacaminos tijera	LC	BA					
31	<i>Nyctidromus albicollis</i>	Curiango	LC	BA					
32	<i>Setopagis parvula</i>	Atajacaminos chico	LC	BA					
33	<i>Antrastomus rufus</i>	Atajacaminos colorado	LC	BA					
Apodiformes									

N°	Scientific names	Common name in Spanish	IUCN conservation status	Natural community
Apodidae				
34	<i>Chaetura meridionalis</i>	Vencejo de tormenta	LC	CD
Trochilidae				
35	<i>Polytmus guainumbi</i>	Picaflor de antifaz	LC	CC CD
36	<i>Anthracothorax nigricollis</i>	Picaflor vientre negro	LC	BR SI
37	<i>Chlorostilbon lucidus</i>	Picaflor verde	LC	BA SI SA
38	<i>Hylocharis chrysura</i>	Picaflor bronceado	LC	BR SI CC CD
39	<i>Eupetionema macroura</i>	Picaflor tijereta	LC	BR
40	<i>Helimaster furcifer</i>	Picaflor de barbijo	LC	SA CC
41	<i>Thalurania furcata</i>	Picaflor zafiro	LC	BA
Gruiformes				
Aramidae				
42	<i>Aramus guarauna</i>	Carau	LC	BR
Rallidae				
43	<i>Mustelirallus albicollis</i>	Burrito grande	LC	SI VA
44	<i>Laterallus melanophaius</i>	Burrito silbón	LC	VA
45	<i>Gallinula galeata</i>	Polla negra	LC	VA
46	<i>Aramides ypecaha</i>	Gallineta de agua	LC	VA
47	<i>Aramides cajaneus</i>	Chiricoe	LC	BR
48	<i>Porphyrio flavirostris</i>	Polla celeste	LC	SI
49	<i>Porphyrio martinica</i>	Polla azul	LC	VA
Charadriiformes				
Charadriidae				
50	<i>Himantopus mexicanus</i>	Tero real	LC	VA
51	<i>Vanellus chilensis</i>	Tero tero	LC	BR SI SA VA
Scolopacidae				
52	<i>Tringa solitaria</i>	Pitotoi solitario	LC	SI
Jacanidae				
53	<i>Jacana jacana</i>	Jacana	LC	BR SI SA VA
Rynchopidae				
54	<i>Rynchops niger</i>	Rayador	LC	VA
Ciconiiformes				
Ciconiidae				
55	<i>Jabiru mycteria</i>	Yabirú	LC	SI SA
56	<i>Ciconia maguari</i>	Cigüeña americana	LC	SI VA
57	<i>Mycteria americana</i>	Tuyuyú	LC	SI VA
Suliformes				
Anhingidae				
58	<i>Anhinga anhinga</i>	Aninga	LC	BR VA
Pelecaniformes				
Ardeidae				
59	<i>Tigrisoma lineatum</i>	Hocó colorado	LC	VA
60	<i>Ardea cocoi</i>	Garza mora	LC	VA
61	<i>Ardea alba</i>	Garza blanca	LC	BR SA VA
62	<i>Egretta thula</i>	Garcita blanca	LC	VA
63	<i>Bubulcus ibis</i>	Garcita bueyera	LC	SA
64	<i>Butorides striata</i>	Garcita azulada	LC	BR SA VA
65	<i>Syrigma sibilatrix</i>	Flauta del sol	LC	SI SA VA
66	<i>Nycticorax nycticorax</i>	Garza bruja	LC	SI SA VA
Threskiornithidae				
67	<i>Phimosus infuscatus</i>	Cuervillo cara pelada	LC	BR SI VA
68	<i>Theristicus caerulescens</i>	Bandurria mora	LC	SI VA
69	<i>Theristicus caudatus</i>	Bandurria baya	LC	BR SI CD
70	<i>Platalea ajaja</i>	Espátula rosada	LC	SI VA
Cathartiformes				

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N°	Scientific names	Common name in Spanish	IUCN conservation status	Natural community
Cathartidae				
71	<i>Sarcoramphus papa</i>	Cuervo real	LC	BA BR
72	<i>Coragyps atratus</i>	Cuervo negro	LC	BA BR SI SA CC
73	<i>Cathartes aura</i>	Cuervo cabeza roja	LC	BA BR SI SA VA
74	<i>Cathartes burrovianus</i>	Cuervo cabeza amarilla	LC	SI SA CC
Accipitriformes				
Accipitridae				
75	<i>Leptodon cayanensis</i>	Milano cabeza gris	LC	BA SI
76	<i>Rostrhamus sociabilis</i>	Caracolero	LC	SA
77	<i>Ictinia plumbea</i>	Milano plumizo	LC	BA BR SI
78	<i>Parabuteo unicinctus</i>	Gavilán mixto	LC	BR SA
79	<i>Geranospiza caerulescens</i>	Gavilán patas largas	LC	BA BR
80	<i>Buteogallus meridionalis</i>	Aguilucho colorado	LC	BR SI SA
81	<i>Buteogallus urubitinga</i>	Águila negra	LC	BR
82	<i>Rupornis magnirostris</i>	Taguató común	LC	BA BR SI SA VA CD
Strigiformes				
Strigidae				
83	<i>Megascops choliba</i>	Lechucita común	LC	BA
84	<i>Glaucidium brasilianum</i>	Caburé	LC	BR
85	<i>Athene cunicularia</i>	Lechucita vizcachera	LC	BA SI SA
86	<i>Asio flammeus</i>	Lechuzón de campo	LC	SA
Trogoniformes				
Trogonidae				
87	<i>Trogon curucui</i>	Surucúa aurora	LC	BA BR SI VA CD
88	<i>Trogon surrucura</i>	Surucua común	LC	BA BR
Coraciiformes				
Momotidae				
89	<i>Momotus momota</i>	Burgo	LC	BA BR
Alcedinidae				
90	<i>Megaceryle torquata</i>	Martín pescador grande	LC	BA BR
91	<i>Chloroceryle amazona</i>	Martín pescador mediano	LC	BR
92	<i>Chloroceryle americana</i>	Martín pescador chico	LC	BR
Galbuliformes				
Bucconidae				
93	<i>Nystalus chacuru</i>	Chacurú cara negra	LC	BA SI SA VA CC
94	<i>Nystalus maculatus</i>	Durmilí	LC	BA BR SI VA CC CD
95	<i>Notharchus swainsonii</i>	Chacurú grande	LC	BA
Piciformes				
Ramphastidae				
96	<i>Pteroglossus castanotis</i>	Arasari fajado	LC	BA BR CD
97	<i>Ramphastos toco</i>	Tucán grande	LC	BA BR SI SA CD
Picidae				
98	<i>Picumnus cirratus</i>	Carpinterito común	LC	BA BR SI SA
99	<i>Melanerpes candidus</i>	Carpintero blanco	LC	BA BR SI SA
100	<i>Dryobates passerinus</i>	Carpinterito oliváceo	LC	BA SI SA
101	<i>Campephilus melanoleucos</i>	Carpintero garganta negra	LC	BA
102	<i>Dryocopus lineatus</i>	Carpintero garganta estriada	LC	BA CC CD
103	<i>Celeus lugubris</i>	Carpintero copete pajizo	LC	BR
104	<i>Piculus chrysochloros</i>	Carpintero dorado	LC	BR
105	<i>Colaptes melanochloros</i>	Carpintero real	LC	BA SI SA CC
106	<i>Colaptes campestris</i>	Carpintero campestre	LC	BR SI SA CC
107	<i>Dryobates mixtus</i>	Carpintero bataraz	LC	SA CC CD
Cariamiformes				
Cariamidae				

N°	Scientific names	Common name in Spanish	IUCN conservation status	Natural community					
108	<i>Cariama cristata</i>	Saría patas rojas	LC		BR	SI	SA	CC	CD
Falconiformes									
Falconidae									
109	<i>Micrastur semitorquatus</i>	Halcón montés	LC	BA					
110	<i>Caracara plancus</i>	Carancho	LC	BA	BR	SI	SA	CC	
111	<i>Milvago chimachima</i>	Chimachima	LC				SA	CC	
112	<i>Herpetotheres cachinnans</i>	Guaicurú	LC				SA		
113	<i>Falco femoralis</i>	Halcón plumizo	LC				SA		
114	<i>Falco peregrinus</i>	Halcón peregrino	LC		BR				
115	<i>Falco sparverius</i>	Halconcito colorado	LC		BR	SI	SA	VA	CC
Psittaciformes									
Psittacidae									
116	<i>Myiopsitta monachus</i>	Cotorrita	LC	BA	BR	SI	SA		
117	<i>Brotogeris chiriri</i>	Catita chiriri	LC	BA	BR	SI	SA	CC	CD
118	<i>Pionus maximiliani</i>	Loro choclero	LC	BA		SI		CC	CD
119	<i>Alipiopsitta xanthops</i>	Loro cara amarilla	NT				SA		
120	<i>Amazona aestiva</i>	Loro hablador	NT	BA	BR	SI	SA	CC	CD
121	<i>Amazona amazonica</i>	Loro de ala naranja	LC				SA	CC	
122	<i>Forpus xanthopterygius</i>	Catita viuda	LC	BA		SI	SA	CC	
123	<i>Pyrrhura devillei</i>	Chiripepé ala anaranjada	NT	BA	BR	SI	SA		
124	<i>Pyrrhura frontalis</i>	Chiripepé cabeza verde	LC	BA	BR	SI	SA		CD
125	<i>Eupsittula aurea</i>	Maracaná frente naranja	LC		BR	SI	SA	CC	CD
126	<i>Aratinga nenday</i>	Ñanday	LC				SA	CC	
127	<i>Ara chloropterus</i>	Guacamayo rojo	LC		BR				
128	<i>Psittacara leucophthalmus</i>	Maracaná ala roja	LC	BA	BR	SI	SA	VA	CC
Passeriformes									
Thamnophilidae									
129	<i>Taraba major</i>	Chororó	LC	BA	BR		SA	VA	CC
130	<i>Thamnophilus doliatus</i>	Batará rayado	LC	BA	BR	SI	SA	CC	
131	<i>Thamnophilus caerulescens</i>	Batará plumizo	LC	BA	BR	SI	SA	CC	CD
132	<i>Formicivora rufa</i>	Batará colorado	LC				SA	CC	
Furnariidae									
133	<i>Sittasomus griseicapillus</i>	Guirí	LC		BR				
134	<i>Dendrocolaptes platyrostris</i>	Trepador oscuro	LC		BR			CC	CD
135	<i>Campylorhamphus trochilirostris</i>	Picapalo colorado	LC		BR				
136	<i>Dendrocolaptes picumnus</i>	Trepador colorado	LC	BA					
137	<i>Xiphocolaptes major</i>	Trepador gigante	LC		BR				
138	<i>Lepidocolaptes angustirostris</i>	Chincherito chico	LC	BA	BR	SI	SA	VA	CC
139	<i>Furnarius rufus</i>	Hornero	LC	BA	BR	SI	SA	CC	CD
140	<i>Phacellodomus rufifrons</i>	Espinero frente rojiza	LC	BA	BR	SI	SA	CC	
141	<i>Phacellodomus ruber</i>	Espinero grande	LC			SI	SA		
142	<i>Anumbius annumbi</i>	Leñatero	LC				SA		
143	<i>Certhiaxis cinnamomeus</i>	Curutié colorado	LC		BR	SI	SA		
144	<i>Schoeniophylax phryganophilus</i>	Chotoy	LC		BR	SI	SA	CC	
145	<i>Synallaxis frontalis</i>	Pijuí frente gris	LC		BR				
Tityridae									
146	<i>Tityra inquisitor</i>	Tueré chico	LC	BA					
147	<i>Tityra cayana</i>	Tueré grande	LC	BA	BR				
148	<i>Tityra semifasciata</i>	Tueré enmascarado	LC	BA					
149	<i>Pachyramphus validus</i>	Anambé grande	LC		BR				
150	<i>Pachyramphus viridis</i>	Anambé verdoso	LC	BA					
Tyrannidae									
151	<i>Leptopogon amaurocephalus</i>	Mosqueta corona parda	LC	BA	BR			VA	
152	<i>Hemitriccus margaritaceiventer</i>	Mosqueta ojo dorado	LC	BA	BR	SI	SA	CC	CD

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153	<i>Cnemotriccus fuscatus</i>	Mosqueta ceja blanca	LC	BR
154	<i>Tolmomyias sulphureus</i>	Picochato grande	LC	BR CD
155	<i>Campptostoma obsoletum</i>	Piojito silbón	LC	BA BR SI SA CC
156	<i>Myiopagis viridicata</i>	Fiofío corona dorada	LC	BA BR
157	<i>Myiopagis caniceps</i>	Fiofío ceniciento	LC	BA
158	<i>Elaenia flavogaster</i>	Fiofío copetón	LC	BA BR SI SA VA CC CD
159	<i>Elaenia albiceps</i>	Fiofío silbón	LC	BA
160	<i>Elaenia spectabilis</i>	Fiofío grande	LC	SI SA CC CD
161	<i>Elaenia parvirostris</i>	Fiofío pico corto	LC	SI
162	<i>Lathrotriccus euleri</i>	Mosqueta parda	LC	BA
163	<i>Pyrocephalus rubinus</i>	Churrinche	LC	SA
164	<i>Suiriri suiriri</i>	Suiriri vientre blanco	LC	BR
165	<i>Serpophaga subcristata</i>	Turí turí	LC	BA
166	<i>Serpophaga griseiceps</i>	Piojito trinador	LC	BA
167	<i>Myiophobus fasciatus</i>	Mosqueta estriada	LC	BA
168	<i>Xolmis cinereus</i>	Monjita gris	LC	SI SA CD
169	<i>Xolmis velatus</i>	Monjita velada	LC	BA SI SA VA CD
170	<i>Xolmis irupero</i>	Monjita blanca	LC	BR SA
171	<i>Gubernetes yetapa</i>	Yetapá grande	LC	BA SI
172	<i>Casiornis rufus</i>	Suiriri castaño	LC	BA BR SI
173	<i>Inezia inornata</i>	Piojito picudo	LC	BA BR
174	<i>Myiarchus tyrannulus</i>	Burlisto cola castaño	LC	BA BR SI SA CC
175	<i>Myiarchus swainsoni</i>	Burlisto pico canela	LC	BR SI SA CC
176	<i>Myiarchus ferox</i>	Burlisto pico negro	LC	BA BR SI SA CC CD
177	<i>Machetornis rixosa</i>	Caballerizo	LC	BR SI SA VA CC
178	<i>Pitangus sulphuratus</i>	Pitogüé común	LC	BA BR SI SA CC CD
179	<i>Megarynchus pitangua</i>	Pitanguá	LC	BA BR SI CC CD
180	<i>Myiozetetes similis</i>	Pitogüé mediano	LC	BA BR SI
181	<i>Myiozetetes cayanensis</i>	Pitogüé mediano de alas rufas	LC	BA BR SA
182	<i>Euscarthmus meloryphus</i>	Barullero	LC	BA
183	<i>Myiodynastes maculatus</i>	Pitogüé rayado	LC	BR SI SA CD
184	<i>Legatus leucophaius</i>	Tuquito chico	LC	BR SI SA CC CD
185	<i>Empidonomus aurantioatrocristatus</i>	Tuquito gris	LC	BA BR
186	<i>Tyrannus melancholicus</i>	Suiriri real	LC	BA BR SI SA CC
187	<i>Tyrannus savana</i>	Tijereta	LC	VA
188	<i>Syrstes sibilator</i>	Suirirí silbón	LC	BA BR SI CC
189	<i>Arundinicola leucocephala</i>	Lavandera	LC	SI VA
190	<i>Xenopsaris albinucha</i>	Tijerilla	LC	SA
191	<i>Himenops perspicillatus</i>	Pico de plata	LC	VA
Pipridae				
192	<i>Pipra fasciicauda</i>	Bailarín naranja	LC	BR SA
Vireonidae				
193	<i>Cyclarhis gujanensis</i>	Juan chiviro	LC	BA BR SI SA CC CD
194	<i>Vireo chivi</i>	Chiví común	LC	BA BR SI VA CD
Corvidae				
195	<i>Cyanocorax cyanomelas</i>	Urraca morada	LC	BA BR SI SA CC CD
196	<i>Cyanocorax chrysops</i>	Urraca común	LC	BA BR SI SA VA CC CD
Donacobidae				
197	<i>Donacobius atricapilla</i>	Angú	LC	SA
Hirundinidae				
198	<i>Stelgidopteryx ruficollis</i>	Golondrina ribereña	LC	SI SA
199	<i>Alopocheilidon fucata</i>	Golondrina cabeza rojiza	LC	BR
200	<i>Progne chalybea</i>	Golondrina doméstica	LC	SI SA
201	<i>Progne tapera</i>	Golondrina parda	LC	SI SA VA

N°	Scientific names	Common name in Spanish	IUCN conservation status	Natural community
Poliotilidae				
202	<i>Poliotilta dumicola</i>	Tacuarita azul	LC	BA BR SI VA
Troglodytidae				
203	<i>Troglodytes aedon</i>	Ratona común	LC	BA BR SI
204	<i>Campylorhynchus turdinus</i>	Ratona grande	LC	BA BR SI SA CC CD
Mimidae				
205	<i>Mimus saturninus</i>	Calandria grande	LC	BA BR SI SA CC
206	<i>Mimus triurus</i>	Calandria real	LC	SA CC CS
Turdidae				
207	<i>Turdus leucomelas</i>	Zorzal alas canelas	LC	BA BR SI SA CC CD
208	<i>Turdus rufiventris</i>	Zorzal colorado	LC	BA BR
209	<i>Turdus amaurochalinus</i>	Zorzal mandioca	LC	CD
Emberizidae				
210	<i>Passer domesticus</i>	Gorrión	LC	BA
211	<i>Anthus lutescens</i>	Cachirla chica	LC	BA SI SA
212	<i>Euphonia chlorotica</i>	Viví	LC	BA BR SI SA VA CC CD
213	<i>Spinus magellanicus</i>	Cabecita negra	LC	SI CC
214	<i>Ammodramus humeralis</i>	Cachilo ceja amarilla	LC	BR SI SA CC
215	<i>Zonotrichia capensis</i>	Bendito Sea	LC	BA BR SI SA
Icteridae				
216	<i>Cacicus solitarius</i>	Boyero negro	LC	SI
217	<i>Cacicus chrysopterus</i>	Boyero ala amarilla	LC	BA BR SI SA CC CD
218	<i>Cacicus haemorrhous</i>	Boyero cacique	LC	BA BR SI SA
219	<i>Icterus pyrrhopterus</i>	Boyerito	LC	BA BR SI SA CC CD
220	<i>Molothrus rufoaxillaris</i>	Tordo pico corto	LC	BR CC
221	<i>Molothrus bonariensis</i>	Tordo renegrido	LC	VA
222	<i>Molothrus oryzivorus</i>	Tordo gigante	LC	BR
223	<i>Gnorimopsar chopi</i>	Chopí	LC	BR SI SA CC CD
224	<i>Agelaioides badius</i>	Tordo músico	LC	SI
225	<i>Leistes superciliaris</i>	Pecho colorado	LC	BR
226	<i>Pseudoleistes guirahuro</i>	Chopí estero	LC	BR SI
Parulidae				
227	<i>Setophaga pitiayumi</i>	Pitiayumí	LC	BA BR
228	<i>Myiothlypis flaveola</i>	Arañero amarillo	LC	BA BR SA CD
229	<i>Basileuterus culicivorus</i>	Arañero coronado	LC	BR
230	<i>Geothlypis aequinoctialis</i>	Arañero cara negra	LC	BA SI
Thraupidae				
231	<i>Piranga flava</i>	Fueguero rojo	LC	BR
232	<i>Cyanoloxia brissonii</i>	Reinamora grande	LC	CC
233	<i>Paroaria coronata</i>	Cardenal	LC	SA BR
234	<i>Paroaria capitata</i>	Cardenilla	LC	BR
235	<i>Nemosia pileata</i>	Frutero cabeza negra	LC	BA BR SI
236	<i>Eucometis penicillata</i>	Frutero amarillo	LC	BR
237	<i>Hemithraupis guira</i>	Saíra dorada	LC	BR
238	<i>Thraupis palmarum</i>	Azulejo de palmar	LC	SA
239	<i>Tachyphonus rufus</i>	Frutero negro	LC	BA BR SI SA CC
240	<i>Thraupis sayaca</i>	Chogüí	LC	BA BR SI SA CC CD
241	<i>Stilpnia cayana</i>	Saíra pecho negro	LC	BA
242	<i>Tersina viridis</i>	Tersina	LC	BA BR
243	<i>Dacnis cayana</i>	Saí azul	LC	BA CD
244	<i>Conirostrum speciosum</i>	Mielerito azul	LC	BR VA
245	<i>Sicalis flaveola</i>	Canario paraguay	LC	BA VA
246	<i>Sicalis luteola</i>	Chipíu	LC	SI
247	<i>Emberizoides herbicola</i>	Coludo grande	LC	SI
248	<i>Emberizoides ypiranganus</i>	Coludo chico	LC	SI SA

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249	<i>Embernagra platensis</i>	Verdón	LC	SI VA
250	<i>Volatinia jacarina</i>	Volatinero	LC	SI
251	<i>Sporophila leucoptera</i>	Corbatita blanco	LC	SI
252	<i>Sporophila pileata</i>	Capuchino boina negra	LC	SI
253	<i>Sporophila plumbea</i>	Corbatita plumizo	LC	SA
254	<i>Sporophila angolensis</i>	Curió	LC	BR SI SA
255	<i>Sporophila caerulea</i>	Corbatita común	LC	BA BR SI VA
256	<i>Thlypopsis sordida</i>	Fruterito jilguero	LC	BA BR
257	<i>Coryphospingus cucullatus</i>	Brasita de fuego	LC	BA BR SI CC CD
258	<i>Saltatricula atricollis</i>	Pepitero de corbata	LC	BR SA CC
259	<i>Saltator similis</i>	Pepitero verdoso	LC	BA
260	<i>Saltator coerulescens</i>	Pepitero gris	LC	BA BR SI

BA: high forest; BR: riparian or marginal forest; SA: high savanna; SI: floodable savanna; CC: cerrado fields; CD: Cerradón; VA: aquatic vegetation

Sampling avifauna in different natural communities in study area

(Rebeca Irala, Celso Fernández & Nicolás Cantero)

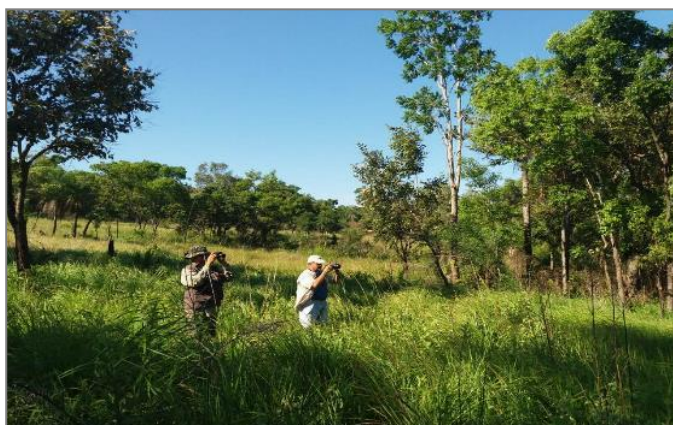




Photo gallery

(Alberto Yanosky y Rebeca Irala)

For more illustrations about species, hábitats and methods of information gathering please visit https://drive.google.com/drive/folders/1gQ_MvyVnfA40ooyv888gar8JDSkluV87?usp=sharing

(Alberto Yanosky y Rebeca Irala)



Ref.: A. *Ramphastos toco*, B. *Psittacara leucophthalma*, C. *Falco sparverius*, D. *Rupornis magnirostris*, E. *Rhea americana*, F. *Trogon curucui*



Ref.: G. *Saltator atricollis*, H. *Alipiopsitta xanthops*, species endemic to the Cerrado, I. *Ara chloropterus* (Alberto Yanosky and Rebeca Irala)



Ref.: I. *Crax fasciola*, J. *Pipile cumanensis* (Nicolás Cantero & Jimmy Emhart)

Mammalogy

List of recorded taxonomic Orders and Families, and number of species

Order	Family	No. Of species
Didelphimorphia	Didelphidae	2
Cingulata	Dasypodidae	3
Pilosa	Myrmecophagidae	2
Primates	Cebidae	1
	Atelidae	1
Lagomorpha	Leporidae	1
Chiroptera	Phyllostomidae	2
Carnivora	Felidae	5
	Canidae	2
	Mustelidae	3
	Mephitidae	1
	Procyonidae	2
Perissodactyla	Tapiridae	1
Cetartiodactyla	Tayassuidae	2
	Cervidae	3
Rodentia	Erethizontidae	1
	Caviidae	2
	Cricetidae	1
	Dasyproctidae	1
	Cuniculidae	1
	Myocastoridae	1

List of mammal species of potential occurrence in the study area

1	<i>Caluromys lanatus</i>	36	<i>Platyrrhinus lineatus</i>	71	<i>Lycalopex gymnocercus</i>
2	<i>Chironectes minimus</i>	37	<i>Pygoderma bilabiatum</i>	72	<i>Speothos venaticus</i>
3	<i>Didelphis albiventris</i>	38	<i>Sturnira lilium</i>	73	<i>Pteronura brasiliensis</i>
4	<i>Gracilinanus agilis</i>	39	<i>Noctilio albiventris</i>	74	<i>Lontra longicaudis</i>
5	<i>Lutreolina crassicaudata</i>	40	<i>Noctilio leporinus</i>	75	<i>Eira barbara</i>
6	<i>Marmosa paraguayana</i>	41	<i>Cynomops abrasus</i>	76	<i>Galictis cuja</i>
7	<i>Monodelphis domestica</i>	42	<i>Cynomops planirostris</i>	77	<i>Conepatus chinga</i>
8	<i>Philander opossum</i>	43	<i>Eumops auripendulus</i>	78	<i>Nasua nasua</i>
9	<i>Philander frenatus</i>	44	<i>Eumops bonariensis</i>	79	<i>Procyon cancrivorus</i>
10	<i>Thylamys macrurus</i>	45	<i>Eumops glaucinus</i>	80	<i>Tapirus terrestres</i>
11	<i>Thylamys pusillus</i>	46	<i>Eumops patagonicus</i>	81	<i>Pecari tajacu</i>
12	<i>Dasypus septemcinctus</i>	47	<i>Eumops perotis</i>	82	<i>Tayassu pecari</i>
13	<i>Dasypus novemcinctus</i>	48	<i>Molossops temminckii</i>	83	<i>Mazama americana</i>
14	<i>Euphractus sexcinctus</i>	49	<i>Molossus currentium</i>	84	<i>Mazama gouazoupira</i>
15	<i>Cabassous tatouay</i>	50	<i>Molossus molossus</i>	85	<i>Mazama nana</i>
16	<i>Priodontes maximus</i>	51	<i>Promops centralis</i>	86	<i>Ozotoceros bezoarticus</i>
17	<i>Myrmecophaga tridactyla</i>	52	<i>Promops nasutus</i>	87	<i>Akodon montensis</i>
18	<i>Tamandua tetradactyla</i>	53	<i>Eptesicus brasiliensis</i>	88	<i>Akodon toba</i>
19	<i>Sapajus cay</i>	54	<i>Eptesicus diminutus</i>	89	<i>Calomys musculinus</i>
20	<i>Aotus azarae</i>	55	<i>Eptesicus furinalis</i>	90	<i>Cerradomys scotti</i>
21	<i>Alouatta caraya</i>	56	<i>Lasiurus ega</i>	91	<i>Holochilus vulpinus</i>
22	<i>Sylvilagus brasiliensis</i>	57	<i>Myotis albescens</i>	92	<i>Hylaeamys megacephalus</i>
23	<i>Peropteryx macrotis</i>	58	<i>Myotis levis</i>	93	<i>Necomys Lasiurus</i>
24	<i>Desmodus rotundus</i>	59	<i>Myotis nigricans</i>	94	<i>Nectomys rattus</i>
25	<i>Glossophaga soricina</i>	60	<i>Myotis riparius</i>	95	<i>Oligoryzomys mattogrossae</i>
26	<i>Chrotopterus auritus</i>	61	<i>Leopardus geoffroyi</i>	96	<i>Oligorizomys nigripes</i>
27	<i>Lophostoma silvicolium</i>	62	<i>Leopardus guttulus</i>	97	<i>Coendou prehensilis</i>
28	<i>Macrophyllum macrophyllum</i>	63	<i>Leopardus braccatus</i>	98	<i>Coendou spinosus</i>
29	<i>Phyllostomus hastatus</i>	64	<i>Leopardus pardalis</i>	99	<i>Cavia aperea</i>
30	<i>Tonatia bidens</i>	65	<i>Leopardus wiedii</i>	100	<i>Hydrochoerus hydrochaeris</i>
31	<i>Carollia perspicillata</i>	66	<i>Puma concolor</i>	101	<i>Dasyprocta azarae</i>
32	<i>Artibeus fimbriatus</i>	67	<i>Puma yagouaroundi</i>	102	<i>Cuniculus paca</i>
33	<i>Artibeus lituratus</i>	68	<i>Panthera onca</i>	103	<i>Clyomys laticeps</i>
34	<i>Artibeus planirostris</i>	69	<i>Cerdocyon thous</i>	104	<i>Thrichomys fosteri</i>
35	<i>Chiroderma doriae</i>	70	<i>Chrysocyon brachyurus</i>	105	<i>Myocastor coypus</i>

Taxonomic list of mammal species

	Scientific names	Common name in Spanish	IUCN Conservation status	Natural Community
Didelphimorphia				
Didelphidae				
1	<i>Chironectes minimus</i>	Comadreja de agua	LC	BR
2	<i>Didelphis albiventris</i>	Comadreja común	LC	BA BR AA
Cingulata				
Dasypodidae				
3	<i>Dasyus novemcinctus</i>	Mulita grande	LC	BA BR SI
4	<i>Eupractus sexinctus</i>	Armadillo de seis bandas	LC	BA BR
5	<i>Cabassous unicinctus</i>	Armadillo de cola pelada	LC	SI AA
Pilosa				
Myrmecophagidae				
6	<i>Myrmecophaga tridactyla</i>	Oso hormiguero gigante	VU	BR CD AA
7	<i>Tamandua tetradactyla</i>	Tamandua	LC	BR CD AA
Primates				
Cebidae				
8	<i>Sapajus cay</i>	Mono capuchino	LC	BR
Atelidae				
9	<i>Alouatta caraya</i>	Mono aullador negro		BA
Lagomorpha				
Leporidae				
10	<i>Sylvilagus brasiliensis</i>	Conejito de monte	NE	BR CD
Chiroptera				
Phyllostomidae				
11	<i>Desmodus rotundus</i>	Vampiro común	LC	
12	<i>Platyrrhinus lineatus</i>	Murciélago listado de Geoffroy	LC	
Carnivora				
Felidae				
13	<i>Leopardus braccatus</i>	Gato del pajonal	NT	BR
14	<i>Leopardus pardalis</i>	Ocelote	LC	BR
15	<i>Herpailurus yagouaroundi</i>	Gato Moro	LC	BA CD
16	<i>Puma concolor</i>	León, puma	LC	BR SI CD
17	<i>Panthera onca</i>	Tigre, jaguar	NT	
Canidae				
18	<i>Cerdocyon thous</i>	Zorro de monte	LC	BA BR SI CD AA
19	<i>Chrysocyon brachyurus</i>	Lobo de crin	NT	
Mustelidae				
20	<i>Lontra longicaudis</i>	Nutria	NT	
21	<i>Eira barbara</i>	Hurón mayor	LC	BR SI

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	Scientific names	Common name in Spanish	IUCN Conservation status	Natural Community
22	<i>Galictis cuja</i>	Hurón menor	LC	
Mephitidae				
23	<i>Conepatus chinga</i>	Zorrino	LC	BR SI
Procyonidae				
24	<i>Nasua nasua</i>	Coatí	LC	BA BR
25	<i>Procyon cancrivorus</i>	Osito lavador, mayuato	LC	BA BR SI VA CD AA
Perissodactyla				
Tapiridae				
26	<i>Tapirus terrestris</i>	Tapir, anta	VU	BA BR CD
Cetartiodactyla				
Tayassuidae				
27	<i>Pecari tajacu</i>	Pecarí de collar	LC	BA BR SI CD
28	<i>Tayassu pecari</i>	Pecarí labiado	VU	BA BR
Cervidae				
29	<i>Mazama americana</i>	Corzuela roja	DD	BA BR VA
30	<i>Mazama gouazoubira</i>	Corzuela parda	LC	BR SI CD AA
31	<i>Ozotoceros bezoarticus</i>	Venadillo, Ciervo de las Pampas	NT	SI CC AA
Rodentia				
Erethizontidae				
32	<i>Coendou prehensilis</i>	Puercospín grande, coendú	LC	
Cricetidae				
33	<i>Cerradomys scotti</i>	Oryzomys de Lindbergh	LC	BR
Caviidae				
34	<i>Cavia aperea</i>	Cuis	LC	BR
35	<i>Hydrochoerus hydrochaeris</i>	Carpincho	LC	SI VA CD
Dasyproctidae				
36	<i>Dasyprocta azarae</i>	Agutí amarillo	DD	BA BR CD
Cuniculidae				
37	<i>Cuniculus paca</i>	Paca	LC	BA BR
Myocastoridae				
38	<i>Myocastor coipus</i>	Coipú	LC	VA

Species of mammals and type of records

No	Scientific name	Common name in Spanish	cited	recorded	referred
1	<i>Chironectes minimus</i>	Comadreja de agua	X	X	-
2	<i>Didelphis albiventris</i>	Comadreja común	X	-	X
3	<i>Dasypus novemcinctus</i>	Mulita grande	X	X	X
4	<i>Eupractus sexinctus</i>	Armadillo de seis bandas	X	X	X
5	<i>Cabassous unicinctus</i>	Armadillo de cola pelada	X	X	X
6	<i>Myrmecophaga tridactyla</i>	Oso hormiguero gigante	X	X	X

No	Scientific name	Common name in Spanish	cited	recorded	referred
7	<i>Tamandua tetradactyla</i>	Tamandua	X	X	X
8	<i>Sapajus cay</i>	Mono capuchino	X	X	X
9	<i>Alouatta caraya</i>	Mono aullador negro	X	X	X
10	<i>Sylvilagus brasiliensis</i>	Conejito de monte	X	X	X
11	<i>Desmodus rotundus</i>	Vampiro común	X	X	X
12	<i>Platyrrhinus lineatus</i>	Murciélago listado de Geoffroy	X	X	-
13	<i>Leopardus braccatus</i>	Gato del pajonal	-	X	-
14	<i>Leopardus pardalis</i>	Ocelote	X	X	X
15	<i>Herpailurus yagouaroundi</i>	Gato Moro	X	X	X
16	<i>Puma concolor</i>	León, puma	X	X	X
17	<i>Panthera onca</i>	Tigre, jaguar	X	X	X
18	<i>Cerdocyon thous</i>	Zorro de monte	X	X	X
19	<i>Chrysocyon brachyurus</i>	Lobo de crin	X	X	X
20	<i>Lontra longicaudis</i>	Nutria	X	X	X
21	<i>Eira barbara</i>	Hurón mayor	X	X	X
22	<i>Galictis cuja</i>	Hurón menor	X	-	X
23	<i>Nasua nasua</i>	Coatí	X	X	X
24	<i>Conepatus chinga</i>	Zorrino	X	X	X
25	<i>Procyon cancrivorus</i>	Osito lavador, mayuato	X	X	X
26	<i>Tapirus terrestris</i>	Tapir, anta	X	X	X
27	<i>Pecari tajacu</i>	Pecarí de collar	X	X	X
28	<i>Tayassu pecari</i>	Pecarí labiado	X	X	X
29	<i>Mazama americana</i>	Corzuela roja	X	X	X
30	<i>Mazama gouazoubira</i>	Corzuela parda	X	X	X
31	<i>Ozotoceros bezoarticus</i>	Venadillo, Ciervo de las Pampas	X	-	X
32	<i>Cerradomys scotti</i>	Oryzomys de Lindbergh	X	X	-
33	<i>Coendou prehensilis</i>	Puercospín grande, coendú	X	X	X
34	<i>Cavia aperea</i>	Cuis	X	X	X
35	<i>Hydrochoerus hydrochaeris</i>	Carpincho	X	X	X
36	<i>Dasyprocta azarae</i>	Agutí amarillo	X	X	X
37	<i>Cuniculus paca</i>	Paca	X	X	X
38	<i>Myocastor coipus</i>	Coipú	X	-	X

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Nro.	Scientific names	Common names	cited	recorded	mentioned
1	<i>Chironectes minimus</i>	Comadreja de agua	X	X	-
2	<i>Didelphis albiventris</i>	Comadreja común	X	-	X
3	<i>Dasyopus novemcinctus</i>	Mulita grande	X	X	X
4	<i>Eupractus sexinctus</i>	Armadillo de seis bandas	X	X	X
5	<i>Cabassous unicinctus</i>	Armadillo de cola pelada	X	X	X
6	<i>Myrmecophaga tridactyla</i>	Oso hormiguero gigante	X	X	X
7	<i>Tamandua tetradactyla</i>	Tamandua	X	X	X
8	<i>Sapajus cay</i>	Mono capuchino	X	X	X
9	<i>Alouatta caraya</i>	Mono aullador negro	X	X	X
10	<i>Sylvilagus brasiliensis</i>	Conejito de monte	X	X	X
11	<i>Desmodus rotundus</i>	Vampiro común	X	X	X
12	<i>Platyrrhinus lineatus</i>	Murciélago listado de Geoffroy	X	X	-
13	<i>Leopardus braccatus</i>	Gato del pajonal	-	X	-
14	<i>Leopardus pardalis</i>	Ocelote	X	X	X
15	<i>Herpailurus yagouaroundi</i>	Gato Moro	X	X	X
16	<i>Puma concolor</i>	León, puma	X	X	X
17	<i>Panthera onca</i>	Tigre, jaguar	X	-	X
18	<i>Cerdocyon thous</i>	Zorro de monte	X	X	X
19	<i>Chrysocyon brachyurus</i>	Lobo de crin	X	-	X
20	<i>Lontra longicaudis</i>	Nutria	X	-	X
21	<i>Eira barbara</i>	Hurón mayor	X	X	X
22	<i>Galictis cuja</i>	Hurón menor	X	-	X
23	<i>Nasua nasua</i>	Coatí	X	X	X
24	<i>Conepatus chinga</i>	Zorrino	X	-	X
25	<i>Procyon cancrivorus</i>	Osito lavador, mayuato	X	X	X
26	<i>Tapirus terrestris</i>	Tapir, anta	X	X	X
27	<i>Pecari tajacu</i>	Pecarí de collar	X	X	X
28	<i>Tayassu pecari</i>	Pecarí labiado	X	X	X
29	<i>Mazama americana</i>	Corzuela roja	X	X	X
30	<i>Mazama gouazoubira</i>	Corzuela parda	X	X	X
31	<i>Ozotoceros bezoarticus</i>	Venadillo, Ciervo de las Pampas	X	-	X
32	<i>Coendou prehensilis</i>	Puercospín grande, coendú	X	X	X
33	<i>Cavia aperea</i>	Cuis	X	X	X
34	<i>Hydrochoerus hydrochaeris</i>	Carpincho	X	X	X
35	<i>Dasyprocta azarae</i>	Agutí amarillo	X	X	X
36	<i>Cuniculus paca</i>	Paca	X	X	X
37	<i>Myocastor coipus</i>	Coipú	X	-	X

Species of high conservation interest

Entre las registradas, se identifican seis de especial interés para la conservación. Se describen brevemente aspectos ecológicos siguiendo a Parera (2017) y Canevari y Vaccaro (2007), sus situaciones de conservación actual y principales amenazas (UICN 2021; APM y SEAM 2017).

■ *Panthera onca* or jaguar

Es el felino más grande del continente americano, de hábitos solitarios y principalmente nocturnos, aunque también puede estar activo de día. Muy territoriales (dejan marcas en los troncos de los árboles y deposiciones para marcar su territorio). Rango de acción entre 10 y más de 300 km², según la disponibilidad de recursos. Habitan gran variedad de ambientes entre bosques secos y húmedos, pastizales, sabanas, etc. Son los predadores tope de la red trófica terrestre en el neotrópico. Presas: pecaríes, carpinchos, pecas, agutíes, armadillos, tapires, monos, corzuelas, garzas, cigüeñas, pavas de monte, otros carnívoros como ocelotes o zorros, e incluso animales domésticos como perros y el ganado. Su reproducción puede ocurrir a lo largo del año, en Paraguay es más frecuente que los nacimientos ocurran entre noviembre y enero. (gestación entre 90 y 110 días, camada de 1 a 4 individuos). El cuidado de las crías lo realiza exclusivamente la hembra, la lactancia se prolonga hasta un semestre y las crías permanecen junto a la madre hasta los 2 años de edad.

La tendencia poblacional de esta especie es decreciente y la distribución histórica de la especie se ha reducido en diferentes partes dando lugar a extinciones locales. En el país sus principales amenazas son la pérdida de hábitat debido al cambio de uso de suelo, la cacería y los conflictos con humanos debido a la predación de ganado.

■ *Leopardus pardalis* or ocelot

Felino manchado mediano de cuerpo compacto, cola corta y extremidades robustas. Es fundamentalmente nocturno, aunque en zonas sin alteración antrópica también se muestra activo durante el día. Vive en ambientes con buena cobertura vegetal (bosques húmedos o secos), o en estepas arbustivas. Su área de acción es variable dependiendo del tipo de ambiente; las hembras pueden abarcar unos 11 km², mientras que los machos hasta 18 km². Se alimenta de mamíferos más pequeños, aves, reptiles anfibios e incluso peces, entre sus presas se puede citar a los agutíes, comadreja, conejos, lagartijas y pequeñas tortugas. No presenta estacionalidad reproductiva, generalmente tiene 1 o 2 crías por camada. Tendencia poblacional decreciente, en el país se encuentra en categoría de Casi Amenazada. Principales amenazas: pérdida de hábitat y caza furtiva para la comercialización de su piel.

■ *Chrysocyon brachyurus* or maned wolf

Es el cánido de mayor tamaño en Sudamérica, con patas negras muy largas, el resto del pelaje rojizo y una crin sobre el cuello y los hombros. Es básicamente nocturno y crepuscular, muy raro de observar durante el día. De hábitos solitarios aunque también puede vivir en pareja. El rango de acción es de aproximadamente 30 km². Su dieta es omnívora, y se alimenta principalmente de roedores pequeños, frutos e insectos, aunque también se alimenta de aves, armadillos, reptiles, anfibios, peces y cangrejos. La reproducción se produce una vez al año entre abril y junio. La gestación dura un poco más de dos meses y la camada tiene entre 1 a 5 crías.

Tendencia poblacional desconocida a escala internacional, sin embargo, en Paraguay su población ha disminuido al menos en un 30% como resultado de la pérdida y la degradación de hábitat. Amenazas:

atropellamientos, cacería por conflictos con humanos por la predación de aves de corral, enfermedades adquiridas por contacto con especies domésticas.

■ *Myrmecophaga tridactyla* or giant anteater

Edentado de larga trompa y lengua, con pelaje duro y largo, con una coloración característica con base negra y una línea blanca que cruza por los flancos hasta el dorso. De hábitos solitarios y catemerales, se lo encuentra principalmente en áreas abiertas como pastizales y sabanas arboladas, aunque también habita bosques secos y húmedos. Su área de acción varía entre 3 a 9 km² y se alimenta exclusivamente de termitas. Su reproducción puede ocurrir a lo largo del año. El periodo de gestación dura un poco más de 6 meses, luego del cual nace una sola cría. La lactancia dura alrededor de 7 meses. Tendencia poblacional decreciente y en Paraguay se estima que su tamaño poblacional disminuyó en un 30%. Amenazas: pérdida de su hábitat, los incendios, el atropellamiento en rutas y la caza ilegal.

■ *Tapirus terrestris* or tapir

El mamífero terrestre sudamericano de mayor tamaño. Considerado un ingeniero del ecosistema ya que modifica los ambientes que habita abriendo caminos entre la vegetación. Habita selvas tropicales y subtropicales, selvas en galería y bosques chaqueños. Es generalmente solitario y fundamentalmente nocturno, aunque también puede estar activo durante el día. Su área de acción es de 40 a 65 km², aunque varios individuos pueden compartir la misma área. Su época reproductiva está aparentemente relacionada con las lluvias. La gestación dura entre 13 a 14 meses, luego de la cual nace una sola cría.

Tendencia poblacional decreciente, se observó una disminución muy importante de su tamaño poblacional en el país, principalmente en la Región Oriental, donde se estima que la disminución fue de un 90%. Amenazas: pérdida y degradación de su hábitat, la cacería furtiva y la caza para consumo, así como las obras viales de gran tamaño.

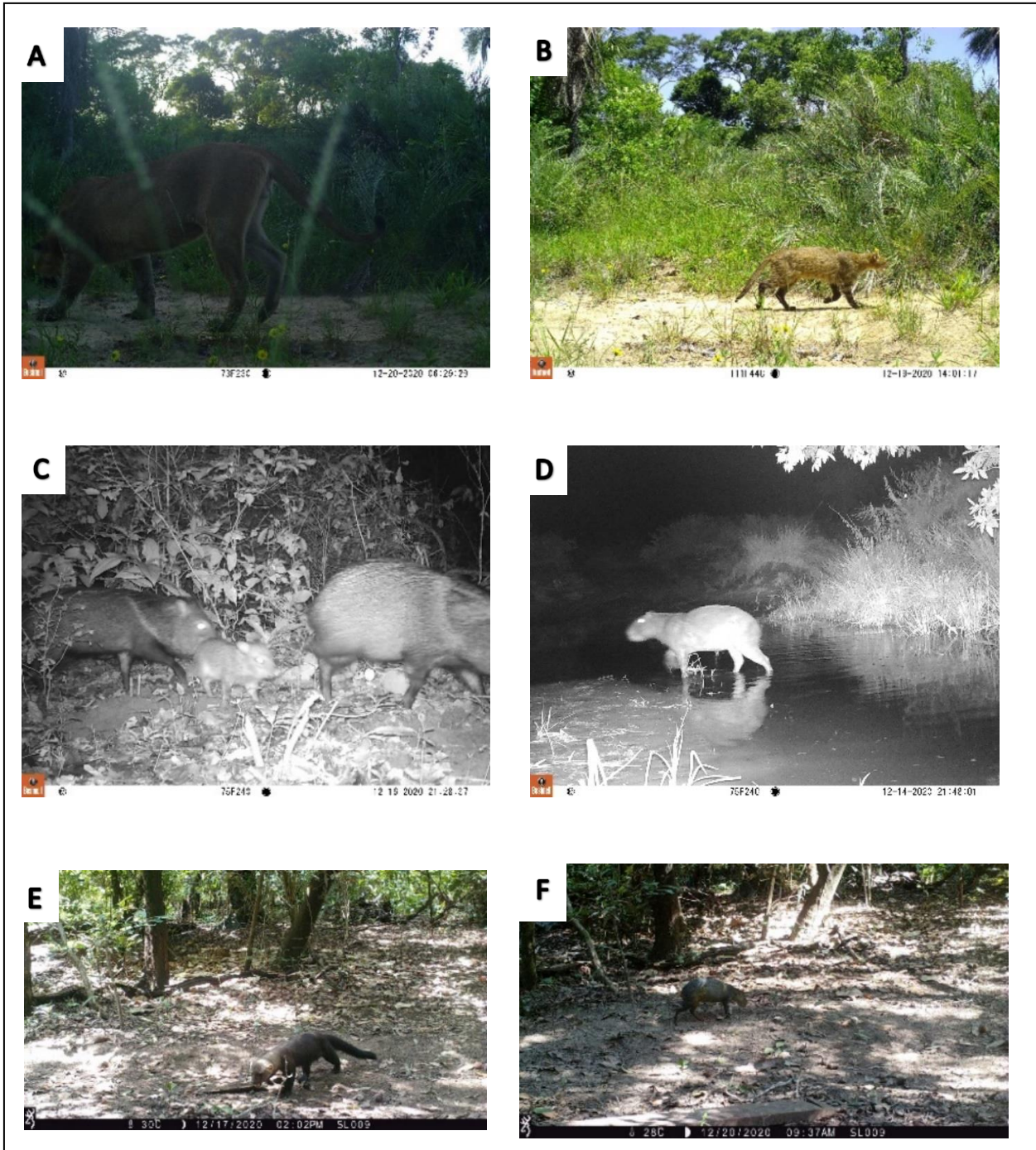
■ *Tayassu pecari* or White-lipped peccary

Es el pecarí de coloración más oscura y se caracteriza por tener el mentón blanco, lo que le da el nombre común en español. Es gregario, formando grandes piaras o grupos de numerosos individuos cuyo tamaño puede variar entre 15 a cientos de individuos. Habita selvas tropicales y subtropicales, bosques secos y húmedos y sabanas. Son nómades, se desplazan por un amplio territorio según la disponibilidad de recursos. Se alimenta de frutos, semillas, flores, hojas, raíces, hongos, gusanos, ranas, ofidios, y hasta pequeños mamíferos. Los nacimientos pueden ocurrir todo el año, la gestación dura entre 5 a 6 meses, luego de la cual nacen 1 a 4 crías (frecuentemente 2)

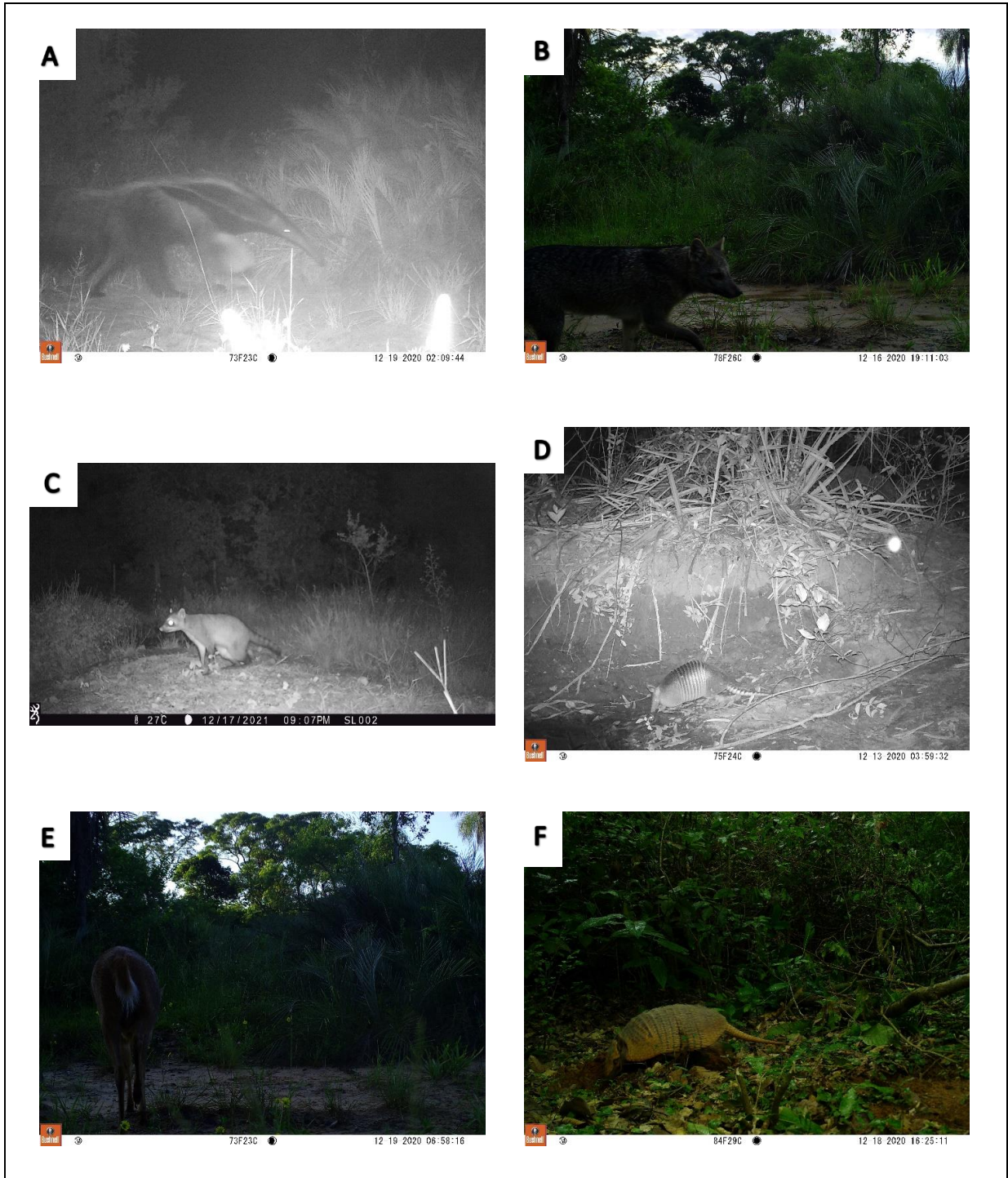
Tendencia poblacional es decreciente, y en el país los datos sugieren una disminución importante a ambos lados del Río Paraguay. Amenazas: pérdida y degradación del hábitat, la cacería furtiva y de consumo, y el avance de la frontera humana sobre áreas silvestres cacería.

Photographs

For more illustrations about species, hábitats and sampling examples please visit <https://drive.google.com/drive/folders/12KyLTp0fQHfHu3J3Yza4JAe3qClf8yJf?usp=sharing>



Photos for some species recorded by camera traps. Ref.: Fototrampeo de A) *Puma concolor*, B) *Leopardus braccatus*, C) *Pecari tajacu*, D) *Hydrochoerus hydrochaeris*, E) *Eira barbara*, F) *Dasyprocta azarae*. (Nicolás Cantero)



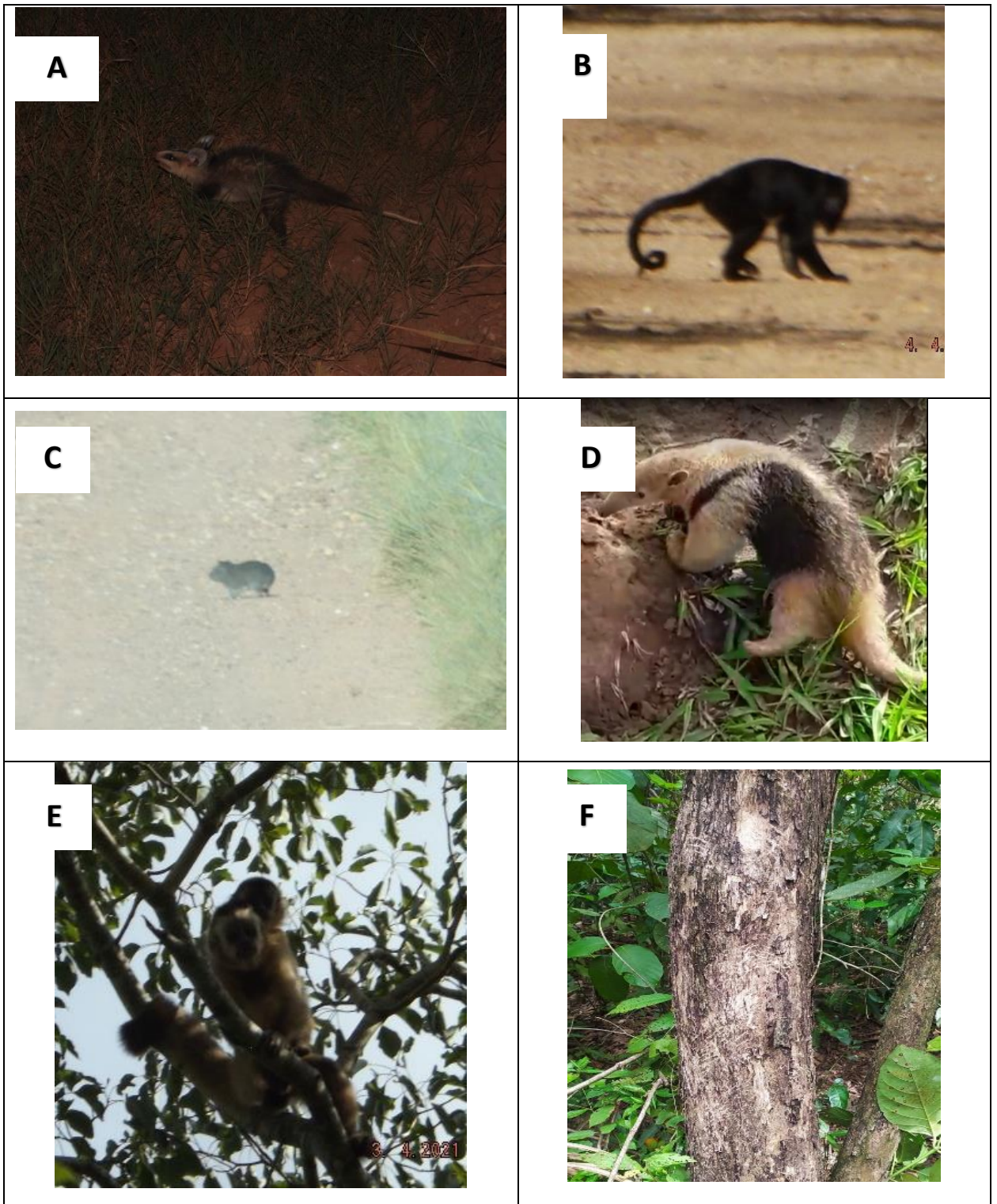
Photos of some species recorded with camera traps. Ref.: A) *Myrmecophaga tridactyla*, B) *Cerdocyon thous*, C) *Procyon cancrivorus*, D) *Dasypus novemcinctus*, E) *Mazama sp.*, F) *Eupractus sexcinctus*. (Nicolás Cantero).



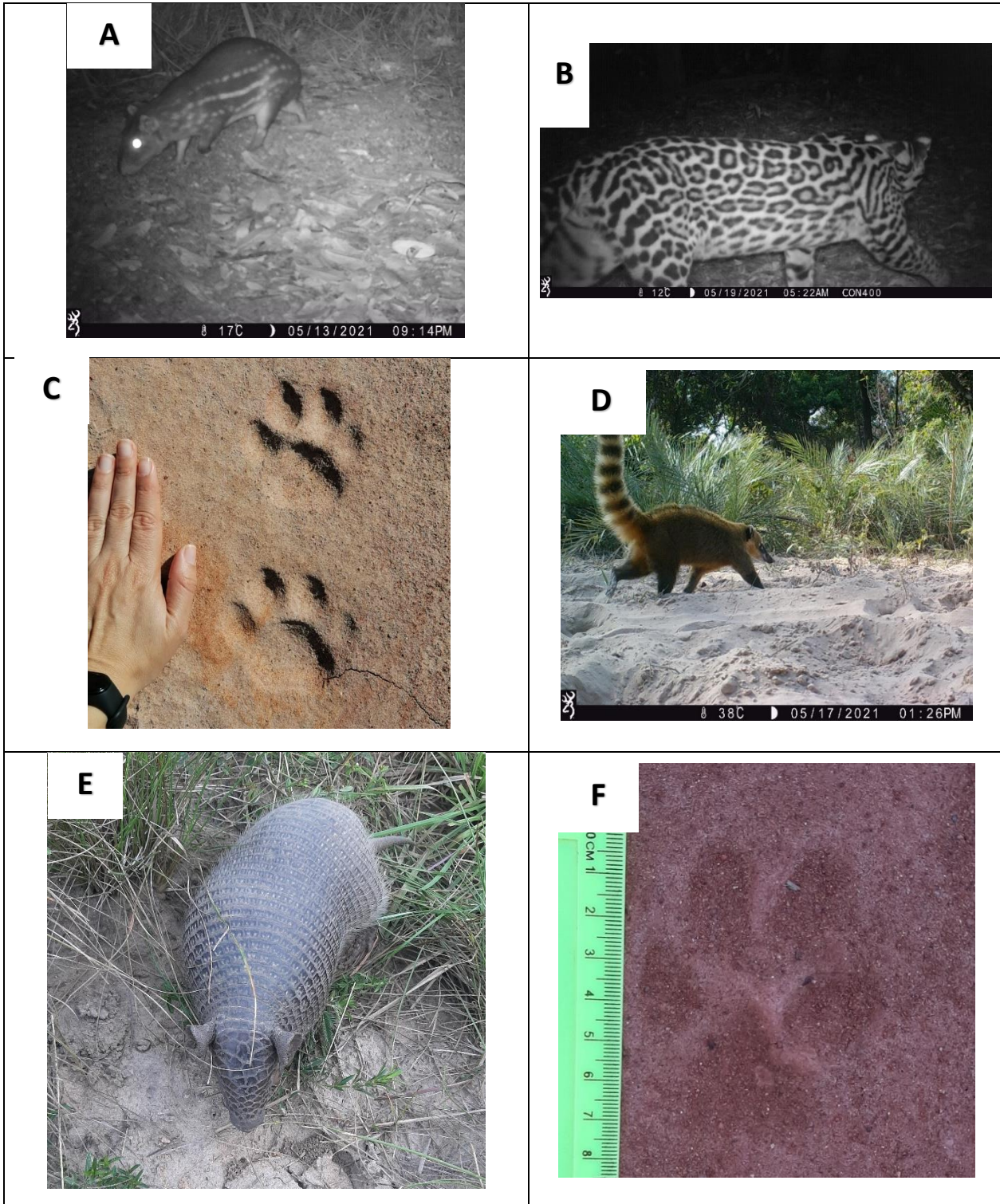
Species, tracks and other signs. Ref.: A) Huellas de *Nasua nasua*, B) Huellas de *Tapirus terrestris*, C) *Sylvilagus brasiliensis*, D) Huellas de *Cavia aperea*, E) *Platyrrhinus lineatus* vista ventral, F) *Platyrrhinus lineatus* vista dorsal. (Nicolás Cantero: A-D; Alberto Yanosky: E and F).

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Photos of mammal speices recorded during sampling. Ref.: A) *Didelphis albiventris*, B) *Alouatta caraya*, C) *Cavia aperea*, D) *Tamandua tetradactyla*, E) *Sapajus cay*, F) Marca de territorio de *Puma concolor*. (Cristhian Báez: A, B y E; Diego Bueno: C y F; Gilberto Shupp: F)



Photos from mammals recorded during the surveys. Ref.: A) *Cuniculus paca*, B) *Leopardus pardalis*, C) Jaguar (*Panthera onca*) footprints, D) *Nasua nasua*, E) *Cabassous unicinctus*, F) Maned wolf (*Chrysocyon brachyurus*) footprint. (Nicolás Cantero: A, B y D; Giselle Villalba : C; Ruth Ferrando: E y F)



Camera trap records of undetermined species, corresponding to the order Rodentia. (Ambas fotografías fueron obtenidas en el mismo sitio, a 800 metros del casco de Gavilan) (22°37'47.78"S, 56°56'46.78"W). (Nicolás Cantero)

Bat community

List of bat species, sampling method, trophic guild (F: frugivorous, N: nectarivorous, I: insectivorous; and conservation status.

No	Family	Species	Trophic guild	Sampling method	Conservation status		Sampling Area (AM)
					UICN	MADES	
1	Phyllostomidae	<i>Carollia perspicillata</i>	F	Direct	LC	LC	Trementina, San Liberato
2	Phyllostomidae	<i>Artibeus lituratus</i>	F	Direct	LC	LC	Soledad
3	Phyllostomidae	<i>Artibeus planirostris</i>	F	Direct	LC	LC	Soledad, San Liberato, Zapallo
4	Phyllostomidae	<i>Glossophaga soricina</i>	N	Direct	LC	LC	San Liberato
5	Phyllostomidae	<i>Plathyrrhinus lineatus</i>	F	Ocassional	LC	LC	Zapallo
6	Vespertilionidae	<i>Lasiurus ega</i>	I	Direct	LC	LC	Trementina, Gavilán, Soledad, San Liberato, Hermosa, Zapallo, Santa Teresa
7	Vespertilionidae	<i>Lasiurus cinereus</i>	I	Indirect	LC	LC	Trementina, Gavilán, San Liberato, Zapallo, Santa Teresa
8	Vespertilionidae	<i>Lasiurus blossevillii</i>	I	Indirect	LC	LC	Trementina, Gavilán, Soledad, San Liberato, Hermosa, Zapallo, Santa Teresa
9	Vespertilionidae	<i>Myotis riparius</i>	I	Direct	LC	LC	Zapallo, Santa Teresa
10	Vespertilionidae	<i>Myotis nigricans</i>	I	Indirect	LC	LC	Soledad, Hermosa, Zapallo
11	Vespertilionidae	<i>Myotis sp</i>	I	Indirect	LC	LC	Trementina, Gavilán, Soledad, San Liberato, Santa Teresa
12	Vespertilionidae	<i>Eptesicus furinalis</i>	I	Indirect	LC	LC	Trementina, Soledad,

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No	Family	Species	Trophic guild	Sampling method	Conservation status		Sampling Area (AM)
							San Liberato Hermosa Santa Teresa
13	Vespertilionidae	<i>Eptesicus sp</i>	I	Direct Indirect	LC	LC	Trementina, Gavilán, Soledad, San Liberato Zapallo
14	Molossidae	<i>Molossus sp</i>	I	Indirect	LC	LC	Trementina
15	Molossidae	<i>Molossus molossus</i>	I	Direct Indirect	LC	LC	Trementina Soledad San Liberato Santa Teresa
16	Molossidae	<i>Molossus rufus</i>	I	Indirect	LC	LC	Trementina, Gavilán, Soledad San Liberato Hermosa Zapallo Santa Teresa
17	Molossidae	<i>Eumops sp</i>	I	Indirect	LC	LC	Trementina, Gavilán, Soledad San Liberato Hermosa Zapallo Santa Teresa
18	Molossidae	<i>Eumops glaucinus</i>	I	Indirect	LC	LC	Soledad Gavilán, Santa Teresa
19	Molossidae	<i>Nyctinomops laticaudatus</i>	I	Indirect	LC	LC	Trementina, Gavilán, Soledad San Liberato Hermosa Zapallo Santa Teresa
20	Molossidae	<i>Nyctinomops macrotis</i>	I	Indirect	LC	LC	Trementina
21	Molossidae	<i>Promops centralis</i>	I	Indirect	LC	LC	Soledad Hermosa San Liberato Santa Teresa
22	Molossidae	<i>Cynomops planirostris</i>	I	Indirect	LC	LC	Trementina
23	Molossidae	<i>Tadarida brasiliensis</i>	I	Indirect	LC	LC	Trementina San Liberato

No	Family	Species	Trophic guild	Sampling method	Conservation status		Sampling Area (AM)
							Soledad Santa Teresa
24	Noctilionidae	<i>Noctilio leporinus</i>	l	Indirect	LC	LC	Hermosa
25	Emballorunidae	<i>Peropteryx macrotis</i>	l	Indirect	LC	VU	Trementina Soledad San Liberato Santa Teresa
26	Emballorunidae	<i>Saccopteryx leptura</i>	i	Indirect	LC	DD	Trementina Soledad Santa Teresa

*no bat species in Paraguay is under any CITES appendix

Richness by species in sampling sites

Species	Sites						
	Trementina	Gavilán	Soledad	San Liberato	Hermosa	Zapallo	Santa Teresa
<i>Carollia perspicillata</i>	X			X			
<i>Artibeus lituratus</i>			X				
<i>Artibeus planirostris</i>			X	X		X	
<i>Plathyrrhinus lineatus</i>						X	
<i>Glossophaga soricina</i>				X			
<i>Lasiurus ega</i>	X	X	X	X	X	X	X
<i>Lasiurus cinereus</i>	X	X		X		X	X
<i>Lasiurus blossevillii</i>	X	X	X	X	X	X	X
<i>Myotis riparius</i>						X	X
<i>Myotis nigricans</i>			X		X	X	
<i>Myotis sp</i>	X	X	X	X			X
<i>Eptesicus furinalis</i>	X		X	X	X		X
<i>Eptesicus sp</i>	X	X	X	X		X	
<i>Molossus sp</i>	X						
<i>Molossus molossus</i>	X		X	X			X
<i>Molossus rufus</i>	X	X	X	X	X	X	X
<i>Eumops sp</i>	X	X	X	X	X	X	X
<i>Eumops glaucinus</i>		X	X				X
<i>Nyctinomops laticaudatus</i>	X	X	X	X	X	X	X
<i>Nyctinomops macrotis</i>	X						
<i>Promops centralis</i>			X	X	X		X
<i>Cynomops planirostris</i>	X						
<i>Tadarida brasiliensis</i>	X		X	X			X
<i>Noctilio leporinus</i>					X		
<i>Peropteryx macrotis</i>	X		X	X			X
<i>Saccopteryx leptura</i>	X		X				X
Total: 26 species	17	9	17	16	9	11	15

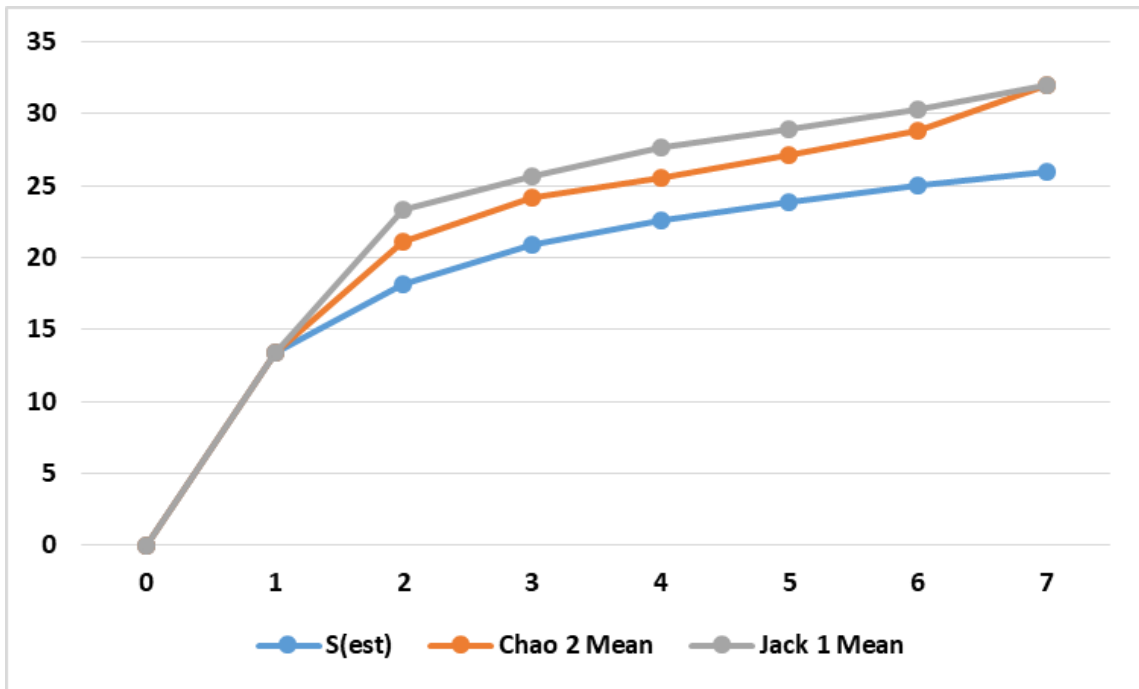
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Shannon and Simpson Indexes applied to the bat community

Sitios	Estancia Trementina	Estancia Gavilán	Estancia Soledad	Estancia San Liberato	Estancia Hermosa	Estancia Zapallo	Estancia Santa Teresa
Indices de Diversidad							
Indice de Shannon	2,18	1,22	2,26	2,11	1,24	1,03	1,75
Indice de Simpson	0,83	0,62	0,87	0,85	0,58	0,47	0,77
Total de especies	17	9	17	16	9	11	15

Accumulation curve for especies found in AM with both methods, direct and bioacoustic.

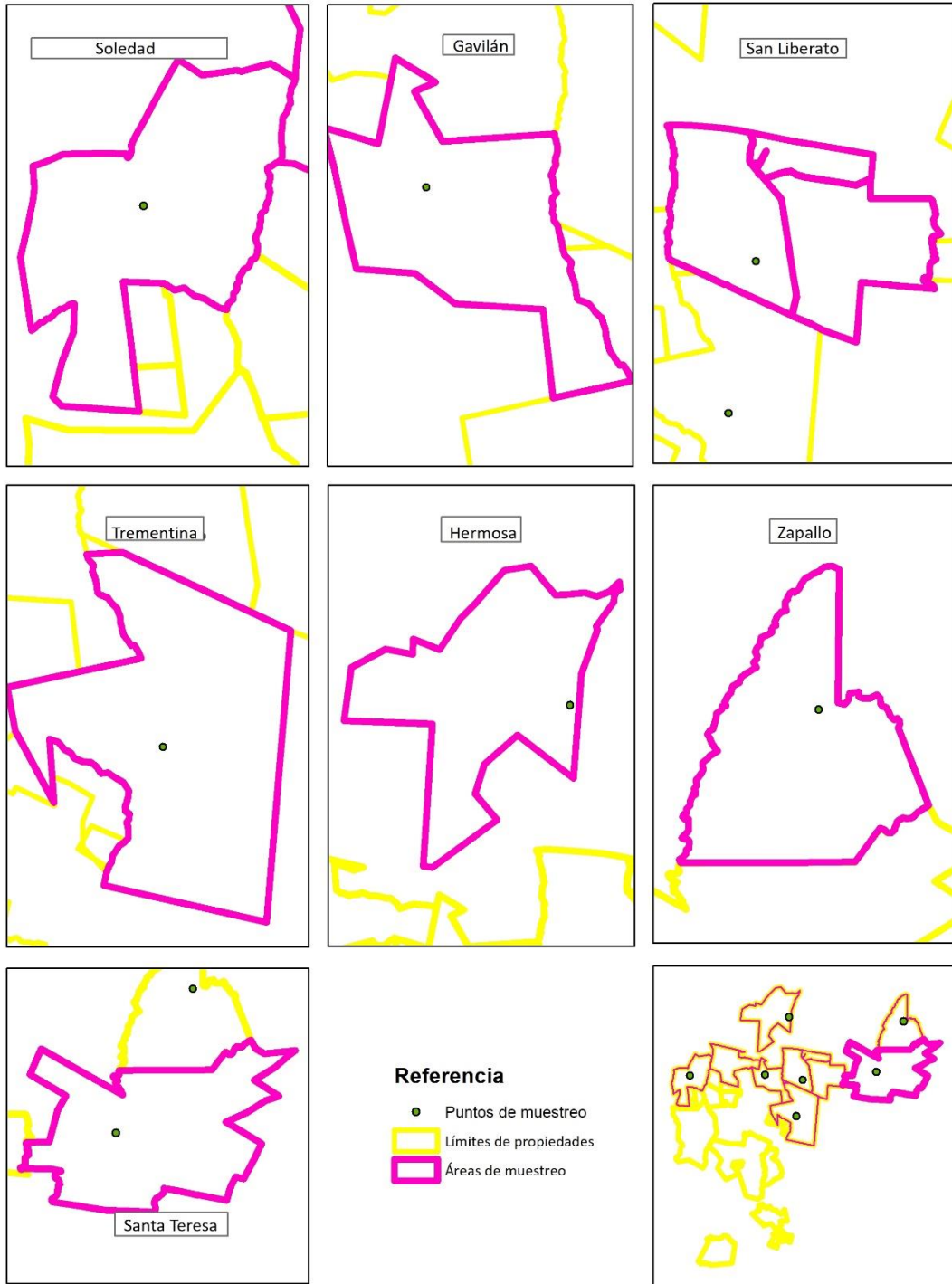


Distribution of sampling points

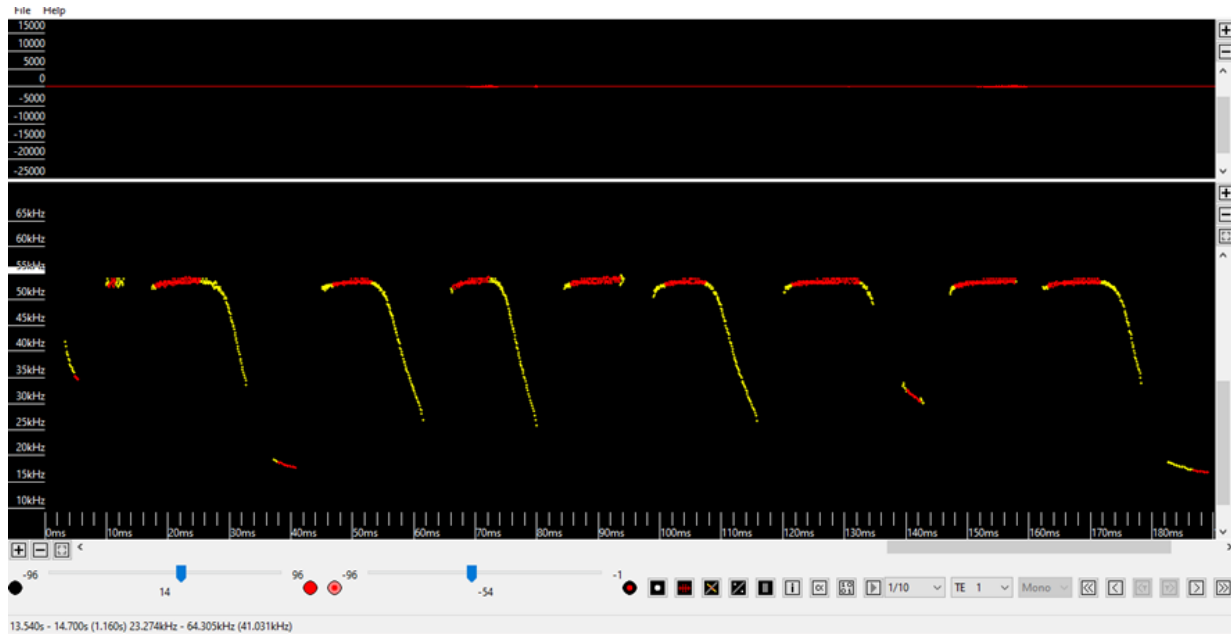


N°	Sampling areas	Coordinates	
		S	W
1	Estancia Trementina	22° 44' 09,1"	56 ° 51' 35,1"
2	Estancia Gavilán	22° 37' 33,3"	56 ° 57' 00,4"
3	Estancia Soledad	22° 37' 39,7"	57 ° 10' 02"
4	Estancia San Liberato	22° 38' 23"	56 ° 50' 27,2"
5	Estancia Hermosa	22° 28' 12,7"	56 ° 52' 49,9"
6	Estancia Zapallo	22° 28' 51,2"	56 ° 33' 03,2"
7	Estancia Santa Teresa	22° 37' 03,1"	56 ° 37' 44,6"

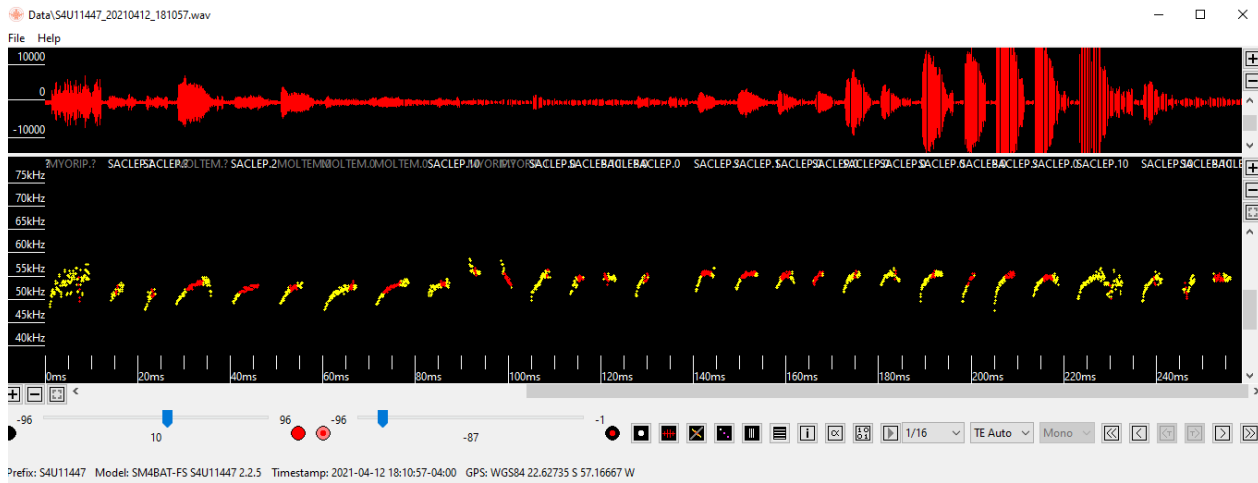
Location of sampling points in each property (AM)



Bioacoustic análisis with Software Kaleidoscope (Wildlife Acoustics- Maynard, Massachusetts, US).
Sonogram for *Noctilio leporinus*, AM Hermosa, Concepcion Departament



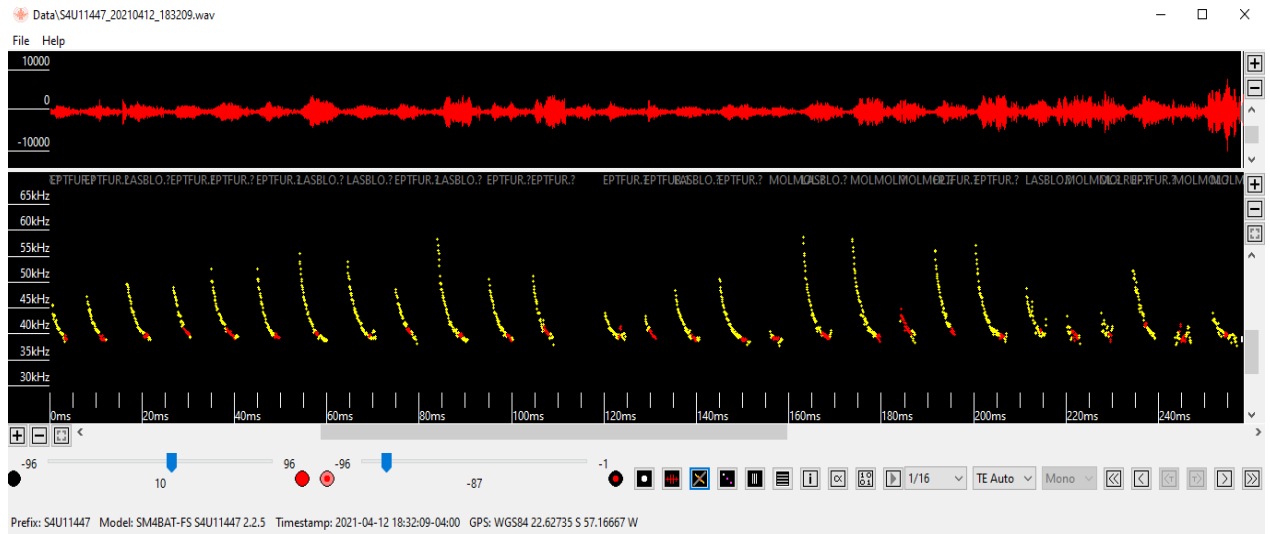
Bioacoustic análisis with Software Kaleidoscope (Wildlife Acoustics- Maynard, Massachusetts, US).
Sonogram for *Sacropteryx leptura*, AM Hermosa, Concepción Departament.



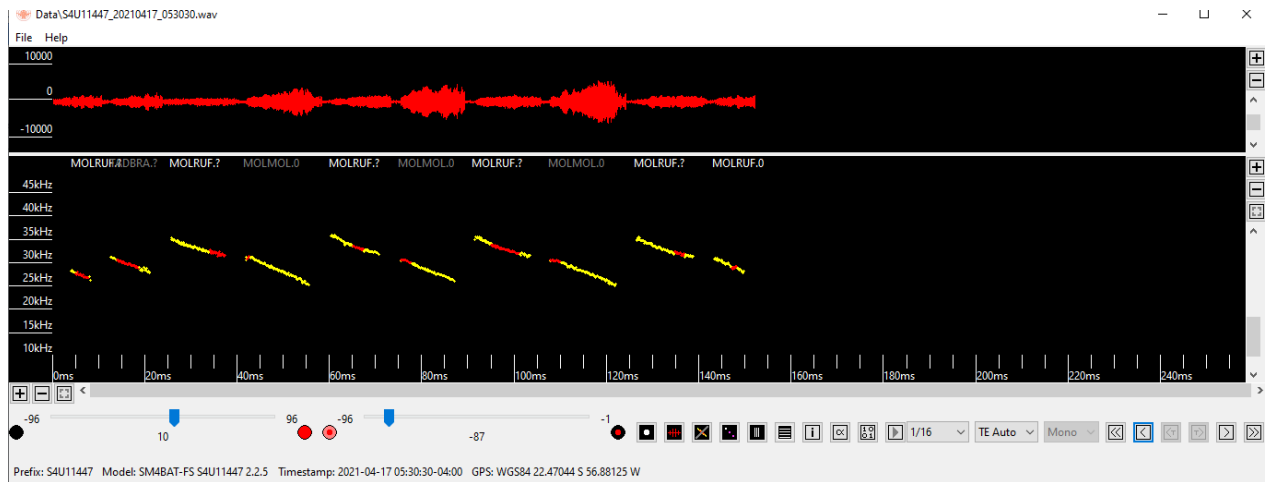
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Bioacoustic análisis with Software Kaleidoscope (*Wildlife Acoustics*- Maynard, Massachusetts, US).
Sonogram for *Eptesicus furinalis*, AM Soledad, Concepcion Departament.



Bioacoustic análisis with Software Kaleidoscope (*Wildlife Acoustics*- Maynard, Massachusetts, US).
Sonogram for *Molossus rufus*, AM Santa Teresa, Amambay Departament.



Mist nets set up in AM San Liberato,



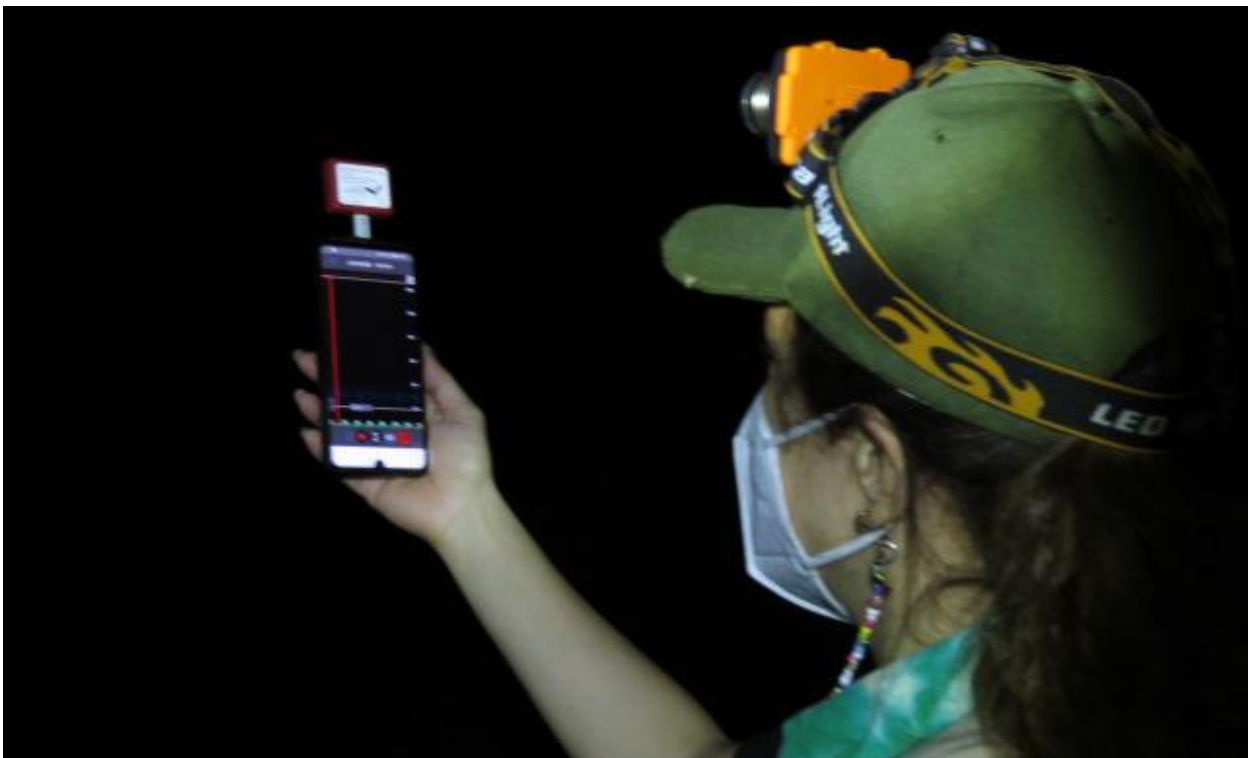
Programming SM4BAT Wildlife Acoustics- Maynard, Massachusetts, US). AM San Liberato



SM4BAT (*Wildlife Acoustics*- Maynard, Massachusetts, Estados Unidos) set up in AM San Liberato



Recording with the *Echo Meter Touch Pro 2* (*Wildlife Acoustics*- Maynard, Massachusetts, US) in AM Trementina.



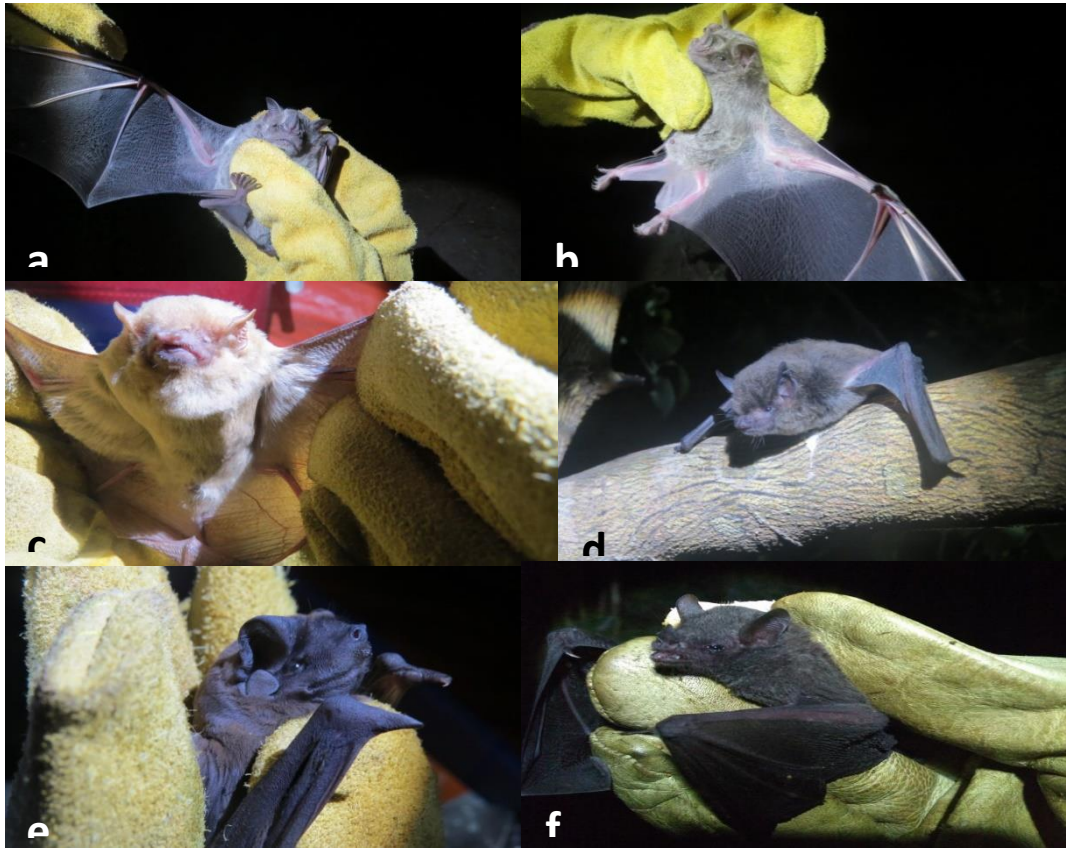
Collecting body measures and other data such as sex, age and weight of an individual in AM San Liberato.



Individuals of *Platyrrhinus lineatus* in AM Zapallo



Specimens captured by direct sampling (mist nets): a) *Artibeus lituratus*, b) *Artibeus planirostris*, c) *Lasiurus ega*, d) *Myotis riparius*, e) *Molossus molossus* y f) *Glossophaga soricina*.



Other species identified

During fieldwork in December 2020 and March-April 2021, there was the opportunity to record other species beyond the focus taxa of the diversity baseline study, including fungi and invertebrates.

Fungi species recorded

In the case of fungi, 40 species of the great variety of existing fungi could be identified.

Especies de Hongos registradas

Nº	Nombre científico	Estado de Conservación UICN	Comunidad Natural	Usos ¹
Ascomycetes				
Orden Xylariales				
Familia Xylariaceae				
1	<i>Xylaria cf. cubensis</i> (Mont.) Fr.	LC	BR	-
2	<i>Xylaria sp.</i>	(L.) Grev.	LC	BR
3	<i>Daldinia concéntrica</i>	(Bolton) Ces. & De Not.	LC	BR
Basidiomycetes				
Orden Polyporales				
Familia Polyporaceae				
4	<i>Ganoderma cfr. lucidum</i> P. Karst.	LC	BR	Me; Actividad antitumoral, antioxidante Y anti HIV
5	<i>Ganoderma australe</i> (Fr.) Pat	LC	BR	Me
6	<i>Pycnoporus sanguineus</i> L. (Murrill)	LC	BR, CD	Me, antioxidante
7	<i>Dichomithus sp.</i> P.K. Buchanan & Ryvarden	DD	BR	-
8	<i>Daedalea sp</i>	Pers.	LC	BR
9	<i>Fomes fasciatus</i> (Sw.) Cooke	LC	BR	Me
10	<i>Trametes villosa</i> (Sw.) Kreisel	LC	BR, CD	Me, Actividad antimicrobiana
11	<i>Hexagonia hydnooides</i> (Sw.) M. Fidalgo	LC	BR, CD	Me, Actividad antimicrobiana
12	<i>Hexagonia papyraceae</i>	Berk.	LC	BR
Familia Meruliaceae				
13	<i>Cymatoderma cfr. Sclerotioides</i> (Lloyd.) D. A. Reid	NT	BR	-
Familia Meripilaceae				
14	<i>Rigidoporus sp</i>	Murrill	LC	BR
Familia Irpicaceae				
15	<i>Hydnopolyporus fimbriatus</i>	(Fr.) D.A.Reid	LC	SA
Orden Hymenochaetales				
Familia Hymenochaetaceae				
16	<i>Fulvifomes rhytiphloeus</i> (Mont.) Ryvarden	Propuesto	BR	-
17	<i>Fuscoporia gilva</i> (Swwein.)	DD	BR	-

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18	<i>Phylloporia sp.</i>	DD	BR	-
Orden Agaricales				
Familia Agaricaceae				
19	<i>Agaricus cfr. campestris</i> . L.	LC	CA	Me, contra la diabetes
20	<i>Agaricus sp</i> L. Fr. Emend Karst.	DD	CA	Co; Me
21	<i>Amanita sp.</i> L.	LC	BR	Tox; micorrícico
22	<i>Podaxis pistillaris</i> L. Fr.	No evaluado	CD	Co; Cos
23	<i>Leucocoprinus cretaceus</i> (Bull.) Locq.	No evaluado	BR	-
24	<i>Leucocoprinus birnbaumii</i> Corda (Singer)	No evaluado	BR	
25	<i>Macrolepiota Singer</i>	LC	SA, SB, CD	Comestible/ Tóxico
Familia Bolbitaceae				
26	<i>Conocybe sp</i> Fayod	LC	BR	Alucinógeno
Familia Pleurotaceae				
27	<i>Pleurotus djamor</i> (Rumph. ex Fr.)	LC	BR	Comestible De alto valor culinario
Familia Strophariaceae				
28	<i>Psilocybe cubensis</i> (Earle) Singer	LC	CD, SA, SB	Alucinógeno, Medicinal
Familia Coprinaceae				
29	<i>Panaeolus sp.</i> (Berk & Brome)	LC	SA, SB	Alucinógeno/ Tóxico
Familia Lycoperdaceae				
30	<i>Calvatia sp.</i> (Batsch) Lloyd	LC	CA	Me; Co
Familia Schizophyllaceae				
31	<i>Schizophyllum commune</i> Fr.	LC	BR, CD	Me; Actividad antitumoral
Familia Marasmiaceae				
32	<i>Marasmius cfr. Spegazinni</i> (Kuntze) Sacc. & P. Syd	DD	BR	-
33	<i>Marasmius haematocephallus</i> (Mont.) Fr.	DD	BR	-
34	<i>Marasmius sp.</i> Fr.	DD	BR	
Familia Physalacriaceae				
35	<i>Oudemansiella canarii</i> (Jungh.) Höhn.	DD	BR	Co
36	<i>Oudemansiella sp.</i> Speg.	DD	BR	
Orden Phallales				
Familia Phallaceae				
37	<i>Phallus impudicus</i> L.	LC	BR	-
Heterobasidios				
Orden Auriculariales				
Familia Auriculariaceae				
38	<i>Auricularia nigricans</i> (Sw.) Birkebak.	LC	BR	Co; rico en antioxidantes
39	<i>Auricularia fuscossuccinea</i> (Mont.) Henn	LC	BR	Co

Orden Dacrymycetales				
Familia Dacrymycetaceae				
40	<i>Dacryophinax</i> cfr. <i>Spathularia</i> (Schwein.) G.W.Martin	LC	CD	Co

Co: edible; Cos: use in cosmetics; Me: medicinal; Tox: toxic

1Artavia, M.M et al (2020); Cai, L. et al. (2013); Campi, M. et al. (2015); Gambato, G. et al. (2016); Gray & Flat (1998); Islas – Santillán, M. A. et al. (2017); Romero Bautista. et al. (2010); Rosa, L.H. et al. (2003); Toledo, C. et al. (2016); Villalobos, S. et al. (2017); Wright & Albertó, (2008).



Photographic records of fungi A y B. *Oudemansiella canarii* C y D. *Marasmius* cfr. *spgazzinni* E y F. *Leucocoprinus cretaceus*.



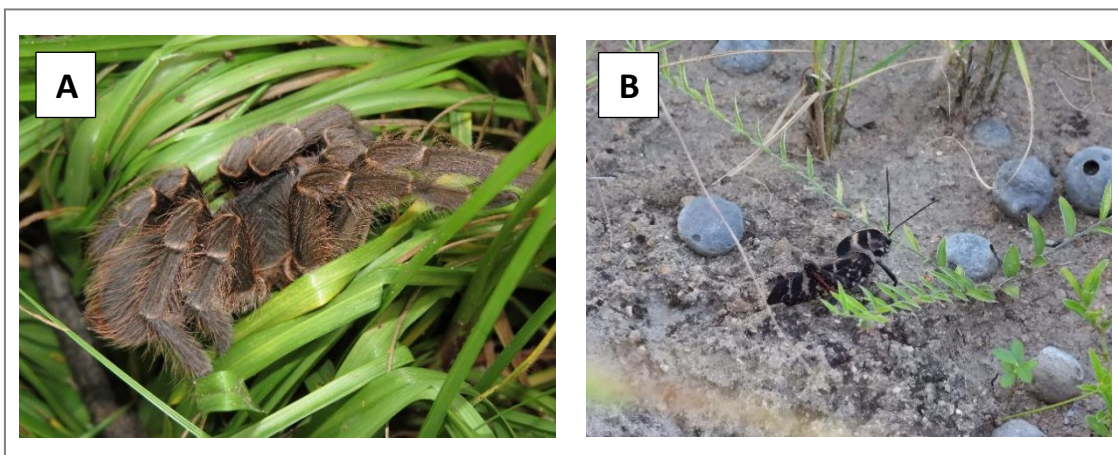
G. *Cymatoderma* sp. **H.** *Phylloporia* sp. **I – J** *Podaxis pistillares* **K.** *Pycnoporus sanguineus* **L.** *Auricularia nigricans*.



M. *Amanita* sp. **N.** *Ganoderma* cfr. *australe*. **O.** *Dacryopinax* cfr. *spathularia*.

Invertebrates

In the case of invertebrates, there are a large number of species and we only focus here on those species for which a photographic record could be achieved. Among them, the diversity of arachnids appears to be high; however, the main record has to do with a tarantula from the Theraphosidae family, probably *Acanthoscurria* sp. On the other hand, *Callonotacris caeruleipennis* (grasshoppers) is a species that was recently registered for Paraguay in the San Luis NP, there is only a known record for the Cerrado ecoregion in the Department of Concepción. During this survey it was recorded and photographed in the closed field (CC).



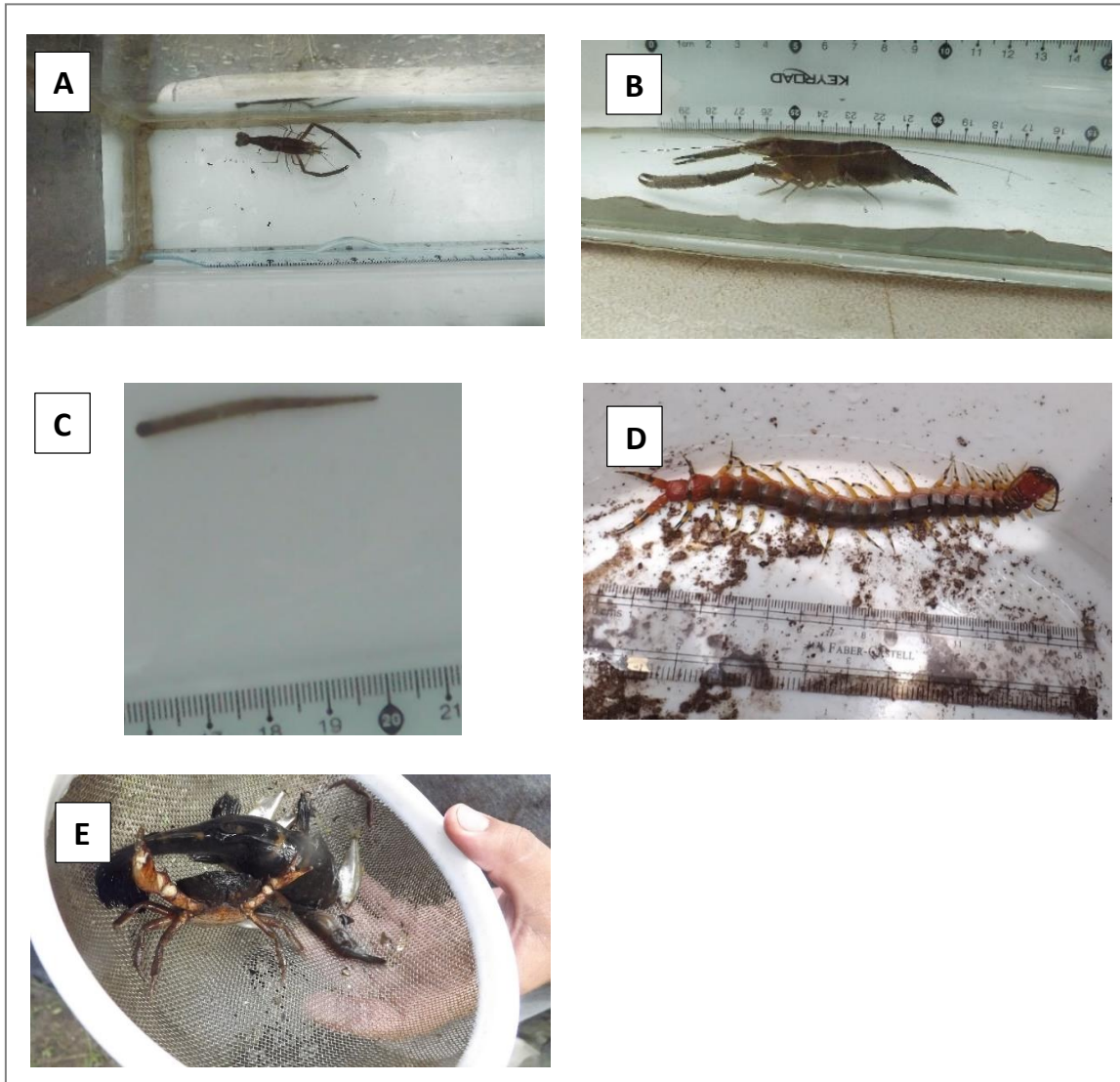
Final report.

Biodiversity Baseline Study of Parcel Properties. Parcel S.A.
May 2021.

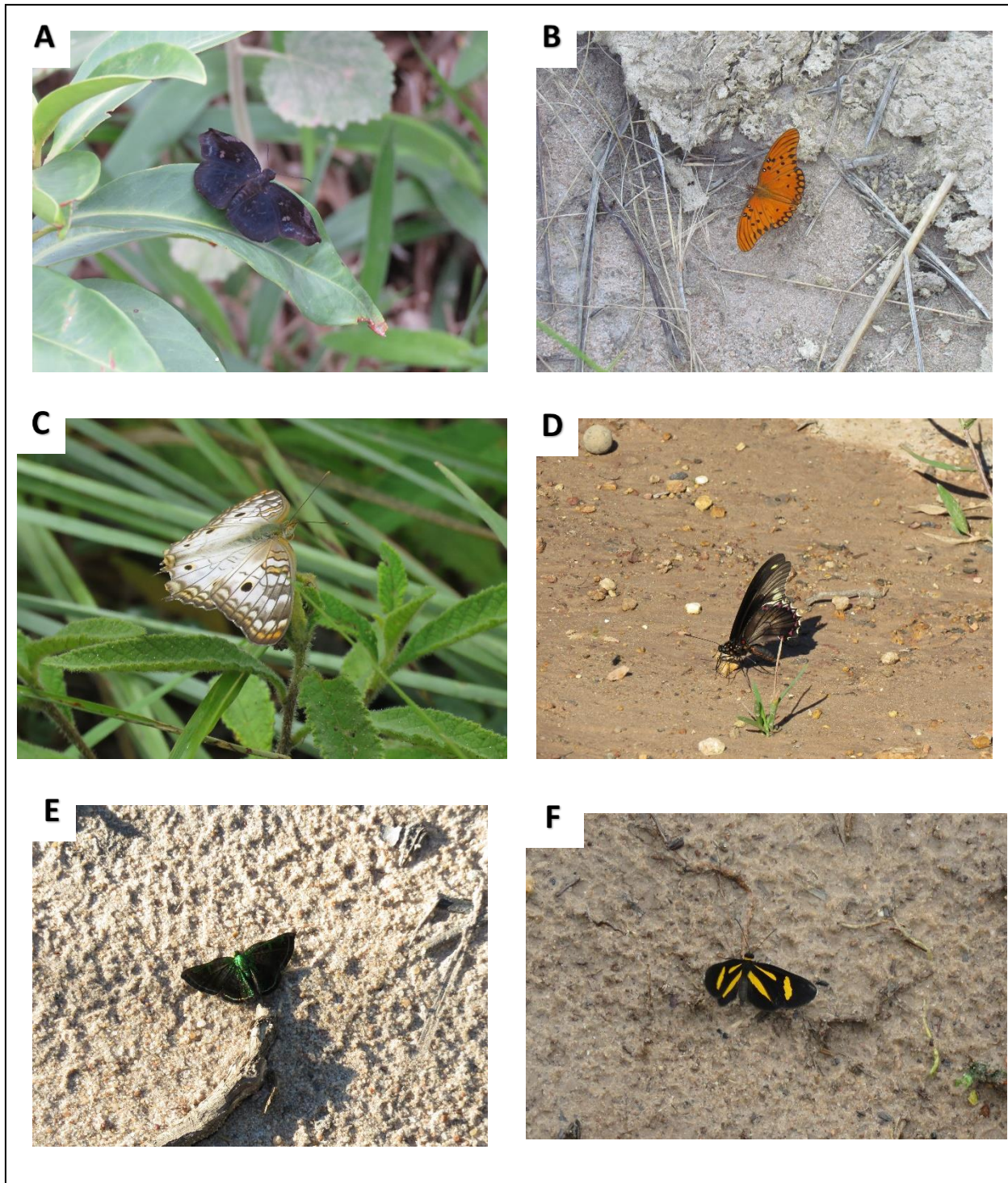
Ref. A) Tarantula of Theraphosidae family (Diego Bueno); B) *Callonotacris caeruleipennis*

Other organisms photographed and identified were those that are presented below, such as palemonids or freshwater shrimp, the scolopendra (myriapod also known as centipedes), the leech (hirudineus) and the trichodactyl or decapod crustacean (next to the fish) that are exemplified with the photos.

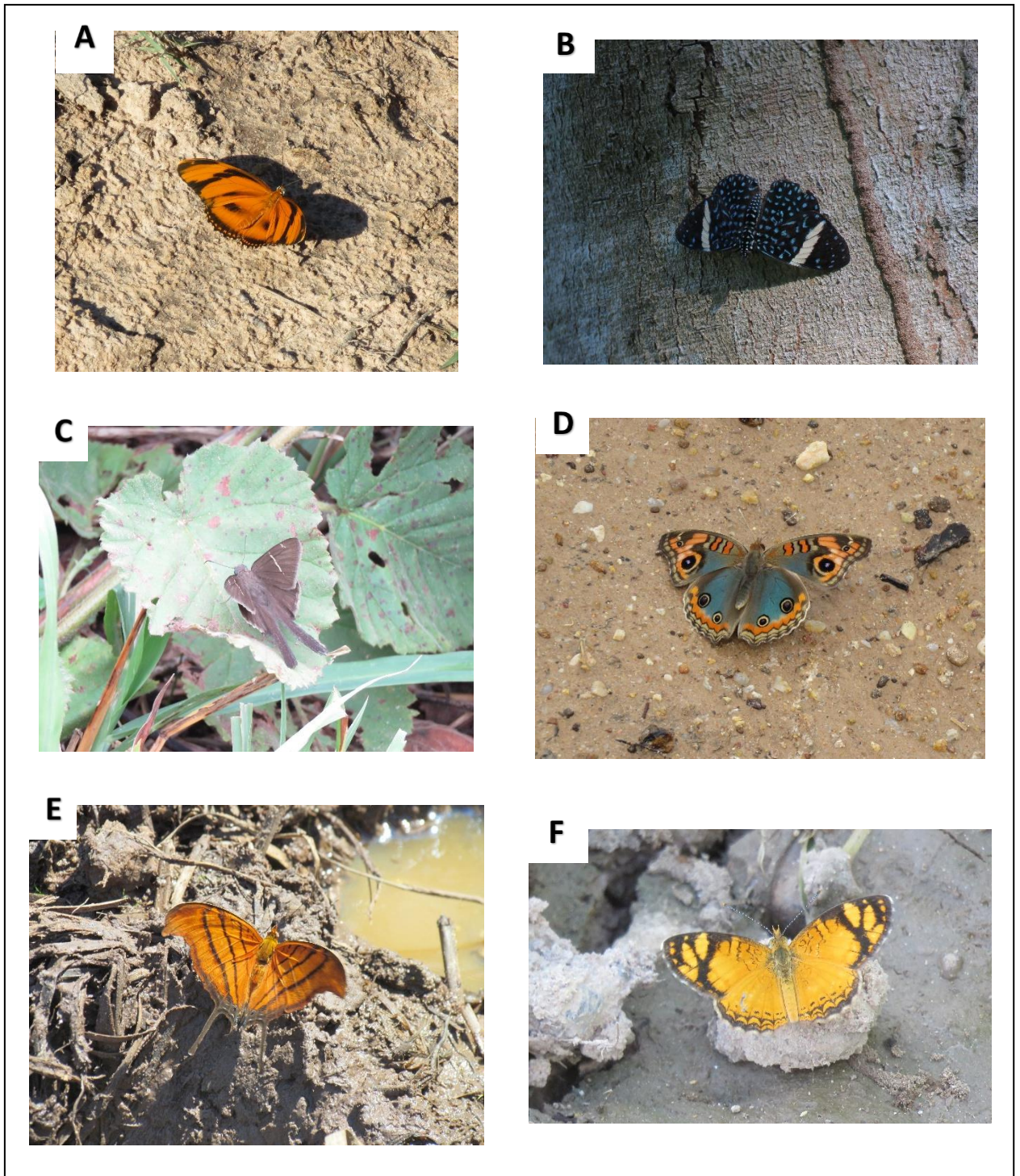
In the same way, a small sample of 12 species of butterflies or Lepidoptera were recorded and are shown in this document.



Ref.: A y B) Palemonids (freshwater shrimps); C) Hirudíneo (leech); D) Escolopendra (miriapod); E) Tricodáctilo (decapod crustacean)




Photographs of some butterflies recorded. Ref.: A) *Achlyodes mithridates*, B) *Agraulis vanillae*, C) *Anartia jatrophae*, D) *Battus polydamas*, E) *Caria marsyas*, F) *Chamaelimnas briola meridionalis*. Fotos: Nicolás Cantero (A, C, D, E y F) y Rebeca Irala (B).



Photos of some species of butterflies recorded. Ref.: A) *Dryadula phaetusa*, B) *Hamadryas amphinome*, C) *Urbanus teleus*, D) *Junonia evarete*, E) *Marpesia petreus*, F) *Tegosa claudina*. Fotos: Nicolás Cantero (A, B, C, D y F) y Rebeca Irala (E).

ANEXO 1: Herramientas utilizadas para el relevamiento de información

- Entrevista a referentes de Estancias
- Encuesta de Percepción Social
- Entrevista grupal
- Entrevista a informantes claves

PROYECTO DE CONSTRUCCIÓN Y OPERACIÓN DE LA PLANTA DE CELULOSA EN EL DEPARTAMENTO DE CONCEPCIÓN Entrevista a referentes de Estancias	 PARACEL

Con el objetivo de acceder a información necesaria para estudios sociales previos a la implementación del proyecto *"Construcción y Operación de una Planta de Celulosa en Concepción"*; resulta de especial interés conocer algunos elementos para la caracterización de la zona de influencia y la percepción con respecto al proyecto. Para el efecto se realizan entrevistas a actores claves a nivel comunitario e institucional como ser: referentes de salud, educación, organizaciones sociales, comités productivos y a responsables o encargados de los establecimientos que serán destinados a las plantaciones forestales.

En este sentido, agradecemos su participación y garantizamos la privacidad de los datos aportados.

1. DATOS DE LOS ENTREVISTADOS

Nombre y Apellido	
Edad	
Cargo	
Tiempo que lleva trabajando en la estancia	
Número de Teléfono	

2. DATOS DEL ESTABLECIMIENTO

2.1 Nombre de la Estancia

--

2.2 ¿Podría señalar cuáles son los rubros principales a los que se dedican en el establecimiento? Ej. Ganadería, agricultura, otros.

2.3 ¿Son propietarios o arrendatarios?

2.4 ¿Cantidad de hectáreas que posee la propiedad?

2.5 En caso de ser arrendatario especificar ¿cuántas hectáreas son utilizadas?

2.6 ¿Desde hace cuántos años que están en el lugar?

2.7 ¿Cuántas personas son empleadas de forma en la estancia? Además, ¿Podría especificar la cantidad de mujeres y varones?

Total de empleados	
Total de empleados Varones	
Total de Empleadas Mujeres	

2.7.1 ¿A qué se dedican principalmente estas personas? Ej. Capataces, tractoristas, veterinarios, otros.

2.7.2 ¿De qué distritos o localidades provienen principalmente?

2.8 Podría estimar en términos de un año ¿cuántas personas son contratadas para trabajos puntuales en la estancia? Es decir, cuántos no son empleados fijos.

2.8.1 ¿A qué se dedican principalmente las personas que no son empleados fijos de la estancia?

2.8.2 ¿De qué distritos o localidades provienen principalmente?


3. PERCEPCION SOCIAL RESPECTO AL PROYECTO

3.1 ¿Usted tiene conocimiento sobre la posible instalación de una planta de celulosa en Concepción?

3.2 ¿Considera que este emprendimiento es positivo a nivel departamental, distrital y local? Sí / No

3.2.1 Por qué:

3.3 Algunas sugerencias o recomendaciones para el proyecto

PROYECTO DE CONSTRUCCIÓN Y OPERACIÓN DE LA PLANTA DE CELULOSA EN EL DEPARTAMENTO DE CONCEPCIÓN Encuesta de Percepción Social	

Con el objetivo de acceder a información necesaria para estudios sociales previos a la implementación del proyecto *“Construcción y Operación de una Planta de Celulosa en Concepción”*; resulta de especial interés conocer su percepción respecto los ítems que contienen esta encuesta. Agradecemos su participación y garantizamos la privacidad de los datos aportados.

1. INFORMACIÓN BÁSICA

Departamento:	N° de Encuesta: <input style="width: 100px;" type="text"/>	Fecha: <input style="width: 40px;" type="text"/> <input style="width: 40px;" type="text"/> <input style="width: 40px;" type="text"/>																
Distrito :	Nombre y Apellido:																	
	Edad:	Sexo:																
Localidad:	Institución:	Cargo:																
	Número de Teléfono:	Grupo de interés:																
Ocupación		Organización																
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>Trabaja</td><td><input type="checkbox"/></td></tr> <tr><td>Estudia</td><td><input type="checkbox"/></td></tr> <tr><td>Jubilado</td><td><input type="checkbox"/></td></tr> <tr><td>Inactivo</td><td><input type="checkbox"/></td></tr> </table>	Trabaja	<input type="checkbox"/>	Estudia	<input type="checkbox"/>	Jubilado	<input type="checkbox"/>	Inactivo	<input type="checkbox"/>	Si trabaja, especificar sector <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>Agricultura-Ganadería</td><td><input type="checkbox"/></td></tr> <tr><td>Servicios</td><td><input type="checkbox"/></td></tr> <tr><td>Industria y comercio</td><td><input type="checkbox"/></td></tr> <tr><td>Público</td><td><input type="checkbox"/></td></tr> </table>	Agricultura-Ganadería	<input type="checkbox"/>	Servicios	<input type="checkbox"/>	Industria y comercio	<input type="checkbox"/>	Público	<input type="checkbox"/>	¿Es miembro de alguna asociación/organización? Sí <input type="checkbox"/> No <input type="checkbox"/> En caso de pertenecer realizar las siguientes preguntas. Nombre: _____ Integrantes: Hombres ___ Mujeres ___
	Trabaja	<input type="checkbox"/>																
Estudia	<input type="checkbox"/>																	
Jubilado	<input type="checkbox"/>																	
Inactivo	<input type="checkbox"/>																	
Agricultura-Ganadería	<input type="checkbox"/>																	
Servicios	<input type="checkbox"/>																	
Industria y comercio	<input type="checkbox"/>																	
Público	<input type="checkbox"/>																	
	Especificar actividad que realiza	Objetivos:																
Nivel de Escolarización		Problemas frecuentes para el cumplimiento de los objetivos:																
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>Primario</td><td><input type="checkbox"/></td></tr> <tr><td>Secundario</td><td><input type="checkbox"/></td></tr> <tr><td>Terciario</td><td><input type="checkbox"/></td></tr> <tr><td>Ninguno</td><td><input type="checkbox"/></td></tr> </table> Especificar Especialidad:			Primario	<input type="checkbox"/>	Secundario	<input type="checkbox"/>	Terciario	<input type="checkbox"/>	Ninguno	<input type="checkbox"/>								
Primario	<input type="checkbox"/>																	
Secundario	<input type="checkbox"/>																	
Terciario	<input type="checkbox"/>																	
Ninguno	<input type="checkbox"/>																	

2- ASPECTOS SOBRE PERCEPCION SOCIAL

2.1 ¿Usted tiene conocimiento sobre la posible instalación de una planta de celulosa en Concepción?

Sí No

2.1.1 ¿Qué conocen o escucharon y por qué medios se enteraron?

2.4 ¿Cuáles considera que deberían ser los principales aspectos a tener en cuenta para la implementación del proyecto?

Generación de empleos a nivel local	Sí <input type="checkbox"/>	No <input type="checkbox"/>
Cuidado y protección del medio ambiente	Sí <input type="checkbox"/>	No <input type="checkbox"/>
Conservación de cuencas hidrográficas	Sí <input type="checkbox"/>	No <input type="checkbox"/>
Protección del patrimonio cultural de la zona	Sí <input type="checkbox"/>	No <input type="checkbox"/>
Acciones para el desarrollo local	Sí <input type="checkbox"/>	No <input type="checkbox"/>
Otros: _____		


2.2 ¿Considera que este emprendimiento es positivo a nivel departamental, distrital y local?

Sí No

2.2.1 Por qué:

2.3 Expectativas con relación al proyecto

2.5 Algunas sugerencias o recomendaciones para el proyecto

PROYECTO DE CONSTRUCCIÓN Y OPERACIÓN DE LA PLANTA DE CELULOSA EN EL DEPARTAMENTO DE CONCEPCIÓN Entrevista grupal	 PARACEL

3.1 Cuestionario para relevamiento de información

Entrevista Grupal (actores comunitarios)


1. Información Básica

Departamento:	Distrito:	Localidad:	Fecha:
Sede			
Cantidad de participantes	Hombres:	Mujeres:	Total:
Breve descripción del Grupo	Lugares-Referentes		

2. Elementos para tener en cuenta

Realizar una breve introducción dando el marco de realización del grupo focal, resaltando la importancia de acceder a información respecto a características de la zona involucrada y la percepción de los presentes sobre el proyecto.

- Presentación del Proyecto.
 - Espacio de preguntas aclaratorias.
 - Antes de la finalización del grupo focal se entrega encuestas a cada participante
 - Guía de preguntas claves relacionadas a aspectos socioeconómicos relevantes respecto a la zona:
3. ¿Cuáles son las principales actividades económicas de la zona?
 4. ¿Qué aspectos positivos pueden mencionar de la zona?
 5. ¿Qué problemas de índole social, económico y cultural pueden mencionar de la zona?
 6. ¿Cuáles son los aspectos que consideran necesarios de ser trabajados en su distrito/departamento para un mayor desarrollo?
 7. ¿Qué planes y proyectos de desarrollo existen y son importantes de considerar?
 8. ¿Qué medios/espacios de comunicación/participación son los más utilizados para compartir información en el distrito/localidad?
 9. ¿Existen organizaciones, asociaciones, etc.? tipo (ejemplo: comisiones vecinales, comités productivos, nucleaciones juveniles, gremiales, religiosas, etc.)
 10. ¿Qué tipo eventos existen en la zona? (tormentas, granizadas, incendios, inundaciones, etc.)

PROYECTO DE CONSTRUCCIÓN Y OPERACIÓN DE LA PLANTA DE CELULOSA EN EL DEPARTAMENTO DE CONCEPCIÓN Entrevista a informantes claves	

3.2 Cuestionario para relevamiento de información

Entrevista a informantes claves

Realizar una breve introducción dando el marco de realización de la entrevista, resaltando la importancia de acceder a información respecto a características de la zona involucrada del proyecto.

1. Información Básica

Departamento:	Distrito:	Localidad:	Fecha:
Nombre y Apellido:			

2. Aspectos históricos de la comunidad

- 2.1 Fecha de fundación:
- 2.2 Historia de la comunidad: (nombre, conformación)
- 2.3 Primeros Pobladores (migración de origen)
- 2.4 Cantidad actual de habitantes:
- 2.5 ¿Existen comunidades indígenas en la zona?

Nombre

Cantidad de Habitantes

2.6 División del territorio (localidades zona urbana y rural):

2.6.1 Límites con otras localidades

3. Aspectos socioeconómicos relevantes de la zona

- 3.1 ¿Cuáles son las principales actividades económicas de la zona?
 - 3.1.2 Situación de empleo
- 3.2 ¿Cuáles son las actividades recreativas, sociales y culturales (incluyendo fiestas tradicionales) por lo general? De niño/as, jóvenes, adultos y adultos mayores?
- 3.3 ¿Qué aspectos positivos tiene para usted vivir en esta zona? (al menos tres)
- 3.4 ¿Puede citar los principales problemas de índole económico/social/cultural que existen en la zona? (solicitar que se mencionen 3 como máximo)

Problemática	1	2	3
Económica			
Social			
Cultural			

3.5 ¿Cuáles son los aspectos que considera necesarios de ser trabajados en su comunidad para un mayor desarrollo? (al menos tres)

3.6 ¿Qué planes y proyectos de desarrollo existen y son importantes de considerar?

3.7 ¿Podría mencionar cuáles son los principales medios de comunicación?

3.8 ¿Cuáles son las principales vías de acceso a la ciudad/localidad?

3.9 Actores claves de la zona que deben ser considerados (instituciones/ organizaciones/referentes comunitarios)

3.10 Principales instituciones existentes en la comunidad

3.10.1 Salud	La comunidad cuenta con	Servicios que presta a la comunidad	Lugar de procedencia de las personas que acuden a la institución	Problemática particular (necesidades existentes antes y (contexto COVID-19)
	Centro de salud Nombre Cantidad de profesionales			
	USF Nombre Cantidad de profesionales			
	Puesto de Salud Nombre Cantidad de profesionales			
	Si no se cuenta en la comunidad dónde acuden y distancia recorrida			
3.10.2 Educación	La comunidad cuenta con	Nombre	Lugar de procedencia de las personas que acuden a la institución	Problemática particular (necesidades existentes antes y (contexto COVID-19)
	Escuela/Nivel Desde: Hasta: Cantidad			
	Colegio/Nivel Desde Hasta Cantidad			
	Universidad Desde Hasta Cantidad			
	Otras			

Si no se cuenta en la comunidad dónde acuden y distancia recorrida					
Institución	Localidad	Nombre	Cantidad de Estudiantes		
			Total	Sexo	
Escuela					
Colegio					
Universidad					
Otras					

Porcentaje de Deserción por año (por sexo)			
Institución	Total	Sexo	
Escuela			
Colegio			
Universidad			
Otras			

Otras instituciones o empresas existentes en la zona:

3.11 ¿Existen organizaciones, asociaciones en la zona? (ejemplo: comisiones vecinales, comités productivos, nucleaciones juveniles, gremiales, religiosas, etc.)

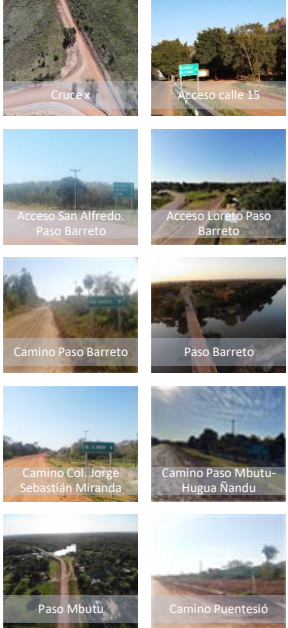

3.12 ¿Qué tipo eventos existen en la zona? (tormentas, granizadas, incendios, inundaciones, etc.)



Consultar sobre:

3.10	Red de agua potable	si ()	No ()	¿De dónde proviene principalmente el agua que utilizan en la comunidad?
	3.10.1 Usos principales del agua en la zona			ESSAP () Junta de saneamiento () Prestador Privado () Pozo () Tajamar () Aljibe () Manantial () Agua de lluvia () Agua Embotellada () Agua superficial (río, arroyo, lago, estanque) () Otros () Especificar _____
3.11	Red de desagüe	si ()	No ()	Tipo de desagüe





				Sanitario/cloacal () Pluvial/lluvia ()		
3.11.1	Pozo séptico/Letrina/Otro	si ()	No ()	Especificar:		
3.12.	Teléfono	si ()	No ()	¿Tiene conexión a internet?	Sí ()	No ()
3.13	Transporte público	si ()	No ()	Tipo de transporte público		
				Intraurbano () Larga distancia ()		
3.13.1	Principal medio de transporte					
3.14	Tratamiento de la basura	Quema () Recolección pública () Recolección privada () Tira en hoyo () ¿Tira en el patio, baldío, zanja o calle? () ¿Tira en el vertedero municipal? () ¿Tira en la chacra? () ¿Tira en el arroyo, río o laguna? () Otros Especificar _____				
3.15	Energía Eléctrica					

ANEXO 2: Registro de actividades principales para los estudios sociales- componente forestal




Fecha/ Actividad	Responsables/ Asistentes	Distritos/ Localidad involucradas	Objetivos de la Actividad	Principales resultados	Registro fotográfico referencial / Fuente de verificación
<p>Martes 22 al viernes 24 de Julio 2020</p> <p>“Primer recorrido en terreno”</p>	<p>Equipo Social: Caren Kremer, Yrene Díaz, Ana Segovia.</p>	<p>-Horqueta -Loreto -Paso Barreto -Sargento José Félix López</p>	<p>-Realizar un recorrido en las zonas donde se encuentran prospectados los campos forestales del proyecto.</p> <p>-Identificar principales vías de acceso a las plantaciones forestales prospectadas y las comunidades existentes en las zonas.</p>	<p>Se han identificado tres accesos principales y 16 comunidades.</p> <p>Acceso Loreto, Paso Barreto: Por esta vía se encuentran las comunidades de Virgen del Camino, Santísima Trinidad Hugua Po’i, Jhugua Guasu, Islería, Laguna Cristo Rey, Anderi, Paso Barreto e Isla Hermosa.</p> <p>Acceso San Alfredo, Paso Barreto: Hasta llegar al cruce se identifican estancias a ambos lados del camino.</p> <p>Acceso Calle 15, Sargento José Félix López: Esta vía conecta con las comunidades de Calle 15 Norte, Domínguez Nigó, Paso Mbutu, Estribo de Plata, Colonia Jorge Sebastián Miranda, Ayala Cue, Sargento José Félix López (Puentesíño).</p>	
<p>Viernes 24 de Julio 2020</p> <p>“Reunión con representantes Primera Región Sanitaria”.</p>	<p>Representantes Primera Región Sanitaria: Cristian Cabrera, Claudia Araujo.</p> <p>Equipo social: Caren Kremer, Ana Segovia.</p>	<p>Primera Región Sanitaria, Concepción</p>	<p>-Presentación del emprendimiento, los trabajos a realizarse en el marco de la elaboración de los estudios sociales correspondientes al componente forestal y el equipo responsable de campo.</p>	<p>Las personas de la institución solicitaron el envío de una nota de pedido dirigida al Director de la Primera Región Sanitaria; especificando la información requerida</p>	 <p>-Registro de Reunión.</p>



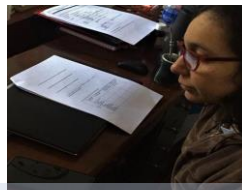
Fecha/ Actividad	Responsables/ Asistentes	Distritos/ Localidad involucradas	Objetivos de la Actividad	Principales resultados	Registro fotográfico referencial / Fuente de verificación
<p>Viernes 31 de Julio</p> <p>Solicitud de información: Primera Región Sanitaria (2)</p>	<p>Equipo Social: Caren Kremer</p>		<p>Solicitud de información estadística y nómina de referentes de USF existentes en los distritos de Loreto, Horqueta, Paso Barreto, Arroyito, y de las localidades de Virgen del Camino, Jhugua Po'i, Jhugua Guazu, Laguna Cristo rey, Anderi, Isla Hermosa, Colonia Jorge Sebastián Miranda, Paso Mbutu, Estribo de Plata y Calle 15.</p>	<p>Se recibió un listado con referentes claves de las USF existentes en las zonas involucradas.</p> <p>Se facilitó información sobre la población total existente en el área de estudio.</p>	 <p>Solicitud de Información</p>
<p>13 de Agosto</p> <p>"Reunión con representantes de gobiernos locales"</p>	<p>Representantes del Municipio: Laude Morel (Intendenta Municipal) David Morel (Secretario General) Israel Florenciano (Jefe de Catastro)</p> <p>Representantes de Paracel: Latifi Chelala (Gerente de Comunicación y Sustentabilidad Social) Diana Liesegang (coordinadora de comunicación visual).</p>	<p>Municipalidad de Sargento José Félix López</p>	<p>-Presentación del emprendimiento, los trabajos a realizarse en el marco de la elaboración de los estudios sociales correspondientes al componente forestal y el equipo responsable de campo.</p>	<p>La Intendente manifiesta apertura y disposición para acompañar las acciones que se realicen en el marco de la elaboración de los estudios sociales para el componente forestal del proyecto; y designa a: David Morel (Secretario General) e Israel Florenciano (Jefe de Catastro) y como enlaces técnicos a nivel local.</p> <p>Menciona que el distrito tiene bastantes necesidades; sobre todo en materia de salud y educación.</p> <p>Asimismo, señala que en la zona existen radios comunitarias tales como Itaky FM-88.9, Radio Más-98.5, y Radio Activa-103.5. Señala la importancia de utilizar esos canales de información a fin de socializar el proyecto con más pobladores y</p>	 <p>Municipalidad de Sargento José Félix López</p> <p>-Registro de Reunión</p>

	Equipo Social: Caren Kremer Ana Segovia			aclarar algunas dudas en materia de producción de eucalipto a gran escala.	
Lunes 17-08-20 "Aplicación de entrevistas, encuestas"	Equipo Social: Ana Segovia Yrene Díaz	Loreto: Virgen del Camino, Hugua Po'i	-Realizar entrevistas a referentes comunitarios e institucionales. -Registro fotográfico de la comunidad y georreferenciación de instituciones identificadas.	-Aplicación de instrumentos de entrevista y encuesta a referente de organización y directores de Instituciones Educativas. -Se realizó un registro fotográfico de las instituciones y sitios de interés de las comunidades involucradas.	
Martes 18-08-2020 "Reunión con representantes de Gobiernos Locales"	Intendente Municipalidad Paso Barreto: Lic. Bruno Carlos Piccinini Soerensen Representantes de Parcel: Latifi Chelala (Gerente de Comunicación y Sustentabilidad Social) Diana Liesegang (coordinadora de comunicación visual) Equipo Social: Caren Kremer	Asunción	-Presentación del emprendimiento, los trabajos a realizarse en el marco de la elaboración de los estudios sociales correspondientes al componente forestal y el equipo responsable de campo. - Solicitar la designación de referentes técnicos institucionales	El Intendente menciona la importancia del emprendimiento a nivel local y para el país. Manifiesta su acompañamiento y disposición para facilitar acciones en el marco de la elaboración de los estudios sociales para el componente forestal del proyecto, y designa a la Sra. Dominica Luscich (Secretaria General).	 -Registro de Reunión
Martes 18-08-20	Equipo Social: Ana Segovia Yrene Díaz	Loreto: Hugua Po'i	-Realizar entrevistas a referentes institucionales.	-Aplicación de instrumentos de entrevista y encuesta a referentes de organización y de la Unidad de Salud Familiar – USF.	

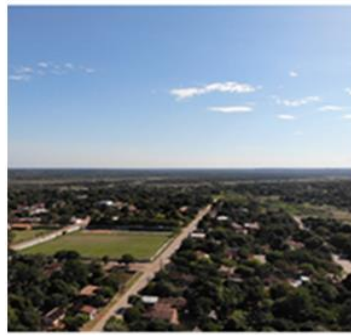
<p>“Aplicación de entrevistas, encuestas”</p>			<p>-Registro fotográfico de la comunidad y georreferenciación de instituciones identificadas.</p>	<p>-Se realizó un registro fotográfico de las instituciones y sitios de interés de las comunidades involucradas.</p>	 <p>Reunión con responsable de la USF</p>
<p>Viernes 19-08-20</p> <p>Solicitud de información: MAG, DGEEC e INFONA</p>	<p>Equipo social: Caren Kremer</p> <p>Responsable Parcel: Latifi Chelala</p>	<p>Asunción</p>	<p>Solicitud de información tanto a nivel departamental como distrital; datos estadísticos de población, acceso a servicios básicos, pobreza, NBI, uso de suelo, recursos forestales, entre otros</p>	<p>Se recibió información actual referente a los temas solicitados, esto por parte de las tres instituciones a las que se envió la solicitud.</p>	 <p>Solicitud de Información</p>
<p>Miércoles 19-08-20</p> <p>“Aplicación de entrevistas, encuestas”</p>	<p>Equipo Social: Ana Segovia Yrene Díaz</p>	<p>Loreto: Jhugua Guazú, Laguna Cristo Rey</p>	<p>-Realizar entrevistas a referentes institucionales.</p> <p>-Registro fotográfico de la comunidad y georreferenciación de instituciones identificadas.</p>	<p>-Aplicación de instrumentos de entrevista y encuesta a referentes de educación y de la Unidad de Salud Familiar – USF.</p> <p>-Se realizó un registro fotográfico de la comunidad de Laguna Cristo Rey y se concertaron próximas reuniones.</p>	 <p>Registro fotográfico de la comunidad</p>
<p>Jueves 20-08-20</p> <p>“Aplicación de entrevistas, encuestas”</p>	<p>Equipo Social: Ana Segovia Yrene Díaz</p>	<p>Paso Barreto: Isla Hermosa Loreto: Laguna Cristo Rey</p>	<p>-Realizar entrevistas a referentes institucionales.</p> <p>-Registro fotográfico de la comunidad y georreferenciación de instituciones.</p>	<p>-Aplicación de instrumentos de entrevista y encuesta a responsables de la Unidad de Salud Familiar – USF de Paso Barreto, del Puesto de Salud de Isla Hermosa, de las Instituciones Educativas de Isla Hermosa y la localidad de Laguna Cristo Rey.</p> <p>-Se realizó un registro fotográfico de las instituciones y sitios de interés de las comunidades involucradas.</p>	 <p>Visita a la USF de Paso Barreto</p>

Fecha/ Actividad	Responsables/ Asistentes	Distritos/ Localidad involucradas	Objetivos de la Actividad	Principales resultados	Registro fotográfico referencial / Fuente de verificación
<p>Viernes 21-08-20</p> <p>“Aplicación de entrevistas, encuestas”</p>	<p>Equipo Social: Ana Segovia Yrene Díaz</p>	<p>Horqueta: Paso Mbutu</p>	<p>-Realizar entrevistas a referentes comunitarios y de instituciones de la zona.</p> <p>-Registro fotográfico de la comunidad y georreferenciación de instituciones.</p>	<p>-Aplicación de instrumentos de entrevista y encuesta a referente de la institución educativa, referente de organización y de la Unidad de Salud Familiar – USF.</p> <p>-Se realizó un registro fotográfico de las instituciones y sitios de interés de la comunidad.</p>	
<p>Martes 08-09-2020</p> <p>“Aplicación de entrevistas, encuestas”</p>	<p>Equipo Social: Caren Kremer Ana Segovia Yrene Díaz</p>	<p>Sargento José Félix López - Puentesíño</p>	<p>-Realizar entrevistas concertadas con referentes institucionales y de estancias.</p> <p>- Registro fotográfico de la comunidad y georreferenciación de instituciones.</p>	<p>-Aplicación de instrumentos de entrevista y encuesta a referentes de la Municipalidad, Unidad de Salud Familiar, Dirección de Extensión Agraria, Supervisión Educativa, y a referentes de estancias de la zona.</p> <p>-Se realizó un registro fotográfico de las instituciones y sitios de interés de la comunidad.</p>	
<p>Miércoles 09-09-20</p> <p>“Aplicación de entrevistas grupales, encuestas”</p>	<p>Equipo Social: Caren Kremer Ana Segovia Yrene Díaz</p>	<p>Sargento José Félix López - Puentesíño</p>	<p>-Realizar entrevistas grupales con la participación de referentes comunitarios y productores locales.</p> <p>- Registro fotográfico de la comunidad y georreferenciación de instituciones.</p>	<p>- Se realizaron en total dos reuniones a fin de aplicar el instrumento de entrevista grupal y de encuesta a representantes del Consejo de Salud, organizaciones y productores locales.</p> <p>-Se realizó un registro fotográfico de las instituciones y sitios de interés existentes en la zona.</p>	

Fecha/ Actividad	Responsables/ Asistentes	Distritos/ Localidad involucradas	Objetivos de la Actividad	Principales resultados	Registro fotográfico referencial / Fuente de verificación
Viernes 11-09-20 "Aplicación de entrevistas, encuestas"	Equipo Social: Ana Segovia Yrene Díaz	Paso Barreto	-Realizar entrevistas concertadas con referentes institucionales. - Registro fotográfico de la comunidad y georreferenciación de instituciones.	-Aplicación de instrumentos de entrevista y encuesta a referentes de la Municipalidad local y de la Supervisión Educativa. -Se realizó un registro fotográfico de las instituciones y sitios de interés existentes en la zona.	 Entrevista con funcionarios de la Municipalidad
Sábado 12-09-20 Lunes 14-09-20 "Aplicación de entrevistas, encuestas"	Equipo Social: Ana Segovia Yrene Díaz	Loreto: Anderí, Hugua Po'i, Virgen del Camino Paso Barreto	-Realizar entrevistas concertadas con referentes institucionales. - Registro fotográfico de la comunidad y georreferenciación de instituciones.	-Aplicación de instrumentos de encuesta y entrevista con referente de la comisión vecinal de la localidad Anderí, registro fotográfico de las comunidades de Virgen del Camino, Jhugua Po'i y la ciudad de Paso Barreto.	 Registro fotográfico de instituciones
Martes 15-09-20 "Aplicación de entrevista grupal, encuestas"	Equipo Social: Ana Segovia Yrene Díaz	Horqueta: Paso Mbutú Estribo de Plata	-Realizar entrevista grupal con referentes comunitarios. -Registro fotográfico de la comunidad y georreferenciación de instituciones.	-Aplicación de instrumentos de entrevista y encuesta durante la reunión llevada a cabo con representantes la comunidad: pescadores, sombrereros, comerciantes, y referentes de la comisión de agua y la USF. -Se realizó un registro fotográfico de las instituciones y sitios de interés existentes en la zona.	 Reunión con referentes de la localidad

Fecha/ Actividad	Responsables/ Asistentes	Distritos/ Localidad involucradas	Objetivos de la Actividad	Principales resultados	Registro fotográfico referencial / Fuente de verificación
Miércoles 16-09-20 Jueves 17-09-20 “Aplicación de entrevistas, encuestas”	Equipo Social: Ana Segovia Yrene Díaz	Arroyito - Horqueta: Calle 15 Loreto: Santísima Trinidad	-Realizar una entrevista con referentes comunitarios e institucionales. - Registro fotográfico de la comunidad y georreferenciación de instituciones.	-Aplicación de instrumentos de entrevista y encuesta con referente de Institución Educativa de Calle 15 y con representantes de la Comisión Vecinal de la localidad de Santísima Trinidad. -Se realizó un registro fotográfico de las instituciones y sitios de interés existentes en la zona.	 Entrevista con la representante institucional
Viernes 18-09-20 “Aplicación de grupo focal y encuestas”	Equipo Social: Ana Segovia Yrene Díaz	Paso Barreto	-Realizar entrevista grupal con referentes comunitarios e institucionales. - Registro fotográfico de la comunidad y georreferenciación de instituciones.	-Aplicación de instrumentos de entrevista y encuesta, se contó con la participación de representantes de: comisión de vivienda, comisión vecinal, USF, concejal distrital y funcionarios de la Municipalidad. -Se realizó un registro fotográfico de las instituciones y sitios de interés existentes en la zona.	 Reunión con representantes del distrito
Lunes 19-09-20 al Miércoles 21-09-20 “Aplicación de entrevistas, encuestas virtuales”	Equipo Social: Ana Segovia Yrene Díaz	Paso Barreto: Colonia Jorge Sebastián Miranda Bella Vista: Ayala Cue Horqueta: Domínguez Nigó	-Realizar entrevistas con referentes comunitarios e institucionales, a través de plataformas virtuales.	-Aplicación de instrumentos de entrevista y encuesta a representantes de Instituciones Educativas y comunitarios de la Colonia Jorge Sebastián, Domínguez Nigó y la comunidad Ayala Cue por medio de reuniones virtuales.	 Reuniones en línea

Anexo 3: Información Distrital complementaria – Caracterización de cada distrito del AID



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Caracterización de cada Distrito AID

Para la elaboración de la presente sección se acudió a fuentes oficiales, tanto a nivel nacional como local respecto a las características sociales, demográficas, económicas y culturales de cada uno de los distritos que conforman el AID del proyecto en su componente forestal. Asimismo, y al no contar con información de esta índole a nivel de localidades, se utilizaron datos cualitativos resultantes del relevamiento en campo (fuentes primarias).

La información fue organizada en subcapítulos por temas de interés, agrupada por distritos y a fin de presentar los datos resultantes del trabajo de campo, fueron elaboradas fichas descriptivas de las localidades involucradas al relevamiento; estas se encuentran en el anexo nro. 4.

Para contar con fuentes actuales, se procedió a la búsqueda y solicitud de datos oficiales a instituciones del nivel nacional, responsables de dicha información, por lo cual, la caracterización aquí presentada está basada en su totalidad en datos de:

- Información oficial proveída por instituciones nacionales como la DGEEC, MAG e INFONA, así como información resultante de la búsqueda en fuentes generadas por el MEC, MOPC, MSPyBS, entre otros.
- Información de nivel local identificada en planes locales de salud y planes municipales de desarrollo.

En cuanto a los datos estadísticos utilizados, se debe considerar que:

- Si bien cierto tipo de información solo pudo ser obtenida de los diferentes Censos realizados: Censo Nacional (2012), Censo Agropecuario (2008), Censo Económico (2011), a través de la Encuesta Permanente de Hogares pudo complementarse dicha información.
- El departamento de Concepción ha pasado por varios desmembramientos en los últimos años, por lo cual cierto tipo de información podría mostrar variaciones según el periodo de elaboración del mismo, sobre todo en el caso de los distritos de Horqueta y San Alfredo.
- En términos de proyecciones de población y datos relacionados, se priorizó la utilización de la información facilitada por la DGEEC correspondiente al periodo 2020-2025.

Para la lectura e interpretación de los datos facilitados por la DGEEC, se realizan las siguientes aclaraciones:

- El Censo Nacional de Población y Viviendas 2012 tuvo una cobertura poblacional aproximada del 74,4% a nivel país; que resulta de comparar la población censada con la población estimada para 2012.
- El departamento de Concepción tuvo una cobertura de 80,8%; y sus distritos: Horqueta 80,6%; Loreto 80,4%; Sargento José Félix López 80,6%; San Alfredo 68,4% y Paso Barreto 95,2%.
- En términos de viviendas, la cobertura fue del 87,1% a nivel nacional; que resulta de la relación de la cantidad de viviendas censadas en el 2012 respecto a la cantidad de viviendas pre-censadas (1.223.165 y 1.404.121 viviendas, respectivamente). El departamento de Concepción tuvo una cobertura de 93,3%; y sus distritos: Horqueta 92,5%; Loreto 92,5% y Sargento José Félix López 89,5%.

En cuanto a Necesidades Básicas Insatisfechas (NBI) se presentan las siguientes explicaciones:

- **NBI en calidad de la vivienda:** 1. *El material utilizado en la construcción es:* Área urbana: Piso de tierra y pared de madera, estaqueo, adobe, tronco de palma, cartón, hule, madera de embalaje, otros, o no tiene pared, y techo de paja, tronco de palma, cartón, hule, madera de embalaje u otro. Área rural: Piso de tierra y pared de estaqueo, adobe, tronco de palma, cartón, hule, madera de embalaje, otros, o no tiene pared, y techo de paja, tronco de palma, cartón, hule, madera de embalaje u otro. 2. *Hacinamiento:* Si registran más de 3 personas por dormitorio.
- **NBI en infraestructura sanitaria:** 3. *Disponibilidad de agua:* Área urbana: Si el agua proviene de ESSAP (ex CORPOSANA), Junta de saneamiento (SENASA), red comunitaria, red privada, pozo artesiano o pozo con brocal y tapa, y llega a la vivienda a través de canilla pública, vecino, aguatero móvil u otros medios, o si proviene de pozo sin brocal y/o tapa, manantial/ycuá, aljibe, aguatero móvil, agua superficial (río, represa, lago, estanque, arroyo, tajamar, canal, etc.) u otra fuente. Área rural: Si el agua proviene de ESSAP (ex CORPOSANA), Junta de saneamiento (SENASA), red comunitaria, red privada, pozo artesiano o pozo con brocal y tapa, y llega a la vivienda a través de canilla pública, vecino, aguatero móvil u otros medios, o si proviene de pozo sin brocal y/o tapa, manantial/ycuá, aljibe, aguatero móvil, agua superficial (río, represa, lago, estanque, arroyo, tajamar, canal, etc.) u otra fuente. 4. *Eliminación de excretas:* Área urbana: Si posee letrina común, desagüe de baño en la superficie de la tierra, arroyo, río, etc., o no tiene servicio sanitario. Área rural: Si posee baño con desagüe en la superficie de la tierra, arroyo, río, etc., o no tiene servicio sanitario.
- **NBI acceso a la educación:** 5. *Asistencia escolar de niños:* Si existe algún niño de 6 a 14 años, emparentado con el jefe de hogar, que no asiste a un establecimiento educativo (se excluye al servicio doméstico y /o los familiares de éstos). 6. *Analfabetismo:* Si existe alguna persona analfabeta (de 15 años o más que en el momento del Censo 2012 no tenía el segundo grado aprobado) emparentada con el jefe de hogar (se excluye al servicio doméstico y / o los familiares de éstos).
- **NBI en capacidad de subsistencia:** 7. *Capacidad de Subsistencia:* Si carece de perceptor (persona ocupada, jubilada, pensionada o rentista) o si el jefe cuenta con una educación inferior a 3 años de educación primaria, y con más de 3 personas en promedio por cada perceptor.

1. Distrito de San Alfredo

1.1 Características generales

San Alfredo es un municipio del departamento de Concepción, ubicado a 494 km de la capital del país y a 78 km al norte de la capital departamental. Tiene una extensión de 2392 km². Limita al norte con el distrito de San Lázaro, al sur con el distrito de Concepción, al este con los distritos Paso Barreto y San Carlos; y al Oeste con el Departamento de Presidente Hayes de la Región Occidental (Chaco). Su distritación data del año 2013, anteriormente formaba parte del distrito de Concepción y era denominada como “Colonia San Alfredo”.



*Acceso a San Alfredo a través de la ruta asfaltada a San Lázaro (Vallemí)
Fuente: Radio Regional 660 AM (2019).¹*

En el Plan Local de Salud se expone que pobladores antiguos comentaron que 100 años atrás el territorio estaba conformado solo por establecimientos ganaderos pertenecientes al Estado y establecimientos privados de explotación forestal cuyos productos eran trasladados a Argentina por el río Paraguay. En cuanto a los primeros pobladores, se sostiene que ocuparon una fracción de la Estancia San Fernando, siendo posteriormente desalojados, lo que les obligó a vivir en chozas provisorias de dicha zona (monte fiscal), creando luego la Colonia San Alfredo, con lotes de 7 hasta 22 hectáreas.

En ese entonces, en San Alfredo se dedicaban a la producción de maíz, mandioca, almidón, tabaco, cítricos, cebolla, locote, tártago y caña de azúcar. “Estos productos eran trasladados en carros y comercializados en el distrito de Concepción; con el ingreso adquirirían vestimentas y herramientas de trabajo”².

Otros datos presentados en la fuente de consulta respecto a su historia son:

- En el año 1936 se construyó la primera escuela con la colaboración de los pobladores.
- Las primeras autoridades fueron denominadas Sargentos de Compañía, designados por la Delegación de Gobierno del Departamento de Concepción. En 1968 se construyó la Comisaría Local.
- En 1980 comenzó la construcción de la actual Escuela Laguna Ybycua y posteriormente el Colegio del mismo nombre.

¹ Disponible en: <https://www.regional660.com/cementera-sera-instalada-en-san-alfredo-y-dara-mas-de-400-puestos-de-trabajo>

² MSPBS-CIRD. (2015) Plan Local de Salud de San Alfredo. Período 2015-2018. Disponible en: <https://www.cird.org.py/institucional/documentos/Plan%20Local%20de%20Salud%20San%20Alfredo.pdf>

1.2. Datos de Población

Según datos de la Dirección General de Estadística, Encuestas y Censo (DGEEC), la población total del departamento de Concepción es de 254.976 habitantes, perteneciendo al Distrito de San Alfredo 5.799 habitantes. Esta totalidad representa el 2,27% del departamento. San Alfredo está conformado por 3.275 hombres y 2.524 mujeres (Proyección 2020)³. Como se puede observar en la siguiente tabla, en su mayoría, es decir, el 56,48% de la población del distrito está conformada por hombres y el 43,52% por mujeres.

Tabla 1. Proyección de la población total por sexo, según distrito. Año 2020

Distrito San Alfredo	Población	Porcentajes
Hombres	3.275	56,48
Mujeres	2.524	43,52
Total (ambos sexos)	5.799	100
% Población Total del Distrito según total del departamento.	254.976	2,27

Fuente: Elaboración propia en base a datos de la DGEEC. Dpto. Concepción. Población estimada y proyectada, según distrito, sexo y grupos de edad, 2000-2025

Como puede observarse en la siguiente tabla sobre proyecciones de evolución / crecimiento de la población, la diferencia en la relación cantidad hombres /mujeres (mayoría hombres) se ha mantenido en los últimos en 5 años.

Tabla 2-a. Evolución de la población en los últimos 5 años (2016-2020)

Distrito San Alfredo Población por sexo	Año				
	2016	2017	2018	2019	2020
Hombres	2.918	3.005	3.093	3.183	3.275
Mujeres	2.361	2.401	2.441	2.482	2.524
Población total	5.279	5.405	5.534	5.665	5.799

Fuente: DGEEC. Dpto. Concepción. Población estimada y proyectada, según distrito, sexo y grupos de edad, 2000-2025

Los siguientes datos de proyección de la población fueron proveídos por la DGEEC, en el marco de elaboración del presente informe. Se debe hacer la salvedad de que existe variación respecto a los datos publicados, debido a las distritaciones que fueron llevadas a cabo de manera posterior a la realización del censo. Como se puede observar en la siguiente tabla, existe una disminución de la población para el Distrito de San Alfredo en relación a lo proyectado en la tabla anterior para el año 2020.

Tabla 3-b. Evolución de la población en los siguientes 5 años (2020-2025)

Departamento y distrito	Año					
	2020	2021	2022	2023	2024	2025
Dpto. Concepción	254.976	258.653	62.360	266.072	269.805	273.579
San Alfredo	4.989	5.070	5.151	5.233	5.315	5.398

Fuente: STP/DGEEC. Paraguay. Proyección de la población por sexo y edad, según distrito, 2000-2025. Revisión 2015

El distrito de San Alfredo, según datos señalados en el Plan Local de Salud, se divide de la siguiente manera:

³ DGEEC. Dpto. Concepción. Población estimada y proyectada, según distrito, sexo y grupos de edad, 2000-2025

- **Zona urbana** que incluye a 10 barrios como: Centro Norte, Costa Florida, Santa Teresita, Chaco í, Mangoty, La Amistad, San Ramón, Centro Sur, María Auxiliadora y Santa Lucía; y
- **Zona rural**, conformada por 6 compañías tales como: Tres Cerros, Itakua, Puerto Fonciere, Guyrati, Peña Hermosa e Itapucumí.

En la Compañía Guyrati se encuentra una **comunidad indígena** perteneciente al Pueblo Originario Anga'ite, integrada por 13 familias y 2 asentamientos (8 de Noviembre y Paz y Alegría).



Escuela de Guyrati - San Alfredo
Fuente: Radio Regional 660 AM (2020).

Hogares, vivienda

Con relación a la condición de propiedad de la vivienda, según datos brindados por la DGEEC⁴, en el distrito de San Alfredo, el mayor porcentaje corresponde a viviendas propias, dándose en menor proporción otras condiciones de propiedad como “alquilada”, “en condominio”, “prestada”, entre otras. Esto se señala en la siguiente tabla.

Tabla 4. Condición de propiedad de la vivienda

Condición de propiedad de la vivienda	Departamento de Concepción	Distrito de San Alfredo
Viviendas particulares ocupadas con personas presentes	42.402	966
% Es propia	85,2	82,0
% La están pagando en cuotas	0,9	-
% Es en condominio	0,4	0,4
% Es alquilada	5,1	1,7
% Es prestada, la cuidan	7,5	15,3
% Es ocupada de hecho	0,8	0,5
% No informado	0,1	0,1

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012.

Necesidades Básicas Insatisfechas (NBI)

En cuanto a las NBI en la zona de influencia Directa del proyecto, se accedió a información proveída por la DGEEC⁵, referente al distrito de San Alfredo en relación a la situación tanto a nivel país como

⁴ Datos solicitados y proveídos por la DGEEC. Sep. 2020.

⁵ DGEEC. Necesidades Básicas Insatisfechas (NBI) 2012 PARAGUAY. Disponible en: <https://www.dgeec.gov.py/Publicaciones/Biblioteca/investigacion%20tematica/Triptico-de-necesidades-insatisfechas-NBI-2012.pdf> y

del departamento, indicando que en el 49,1% de los hogares del mismo se tiene al menos una NBI, el 24,5% corresponde a Hogares con NBI en acceso a la educación, el 21,5% a hogares con NBI en infraestructura sanitaria, el 19,0% a hogares con NBI en calidad de la vivienda y el 12,5% a los Hogares con NBI en capacidad de subsistencia, como puede observarse en la tabla 5.

Tabla 5. Hogares con NBI, según departamento y distrito

Indicadores de Necesidades Básicas Insatisfechas (NBI) (%)	Total País	Departamento de Concepción	Distrito de San Alfredo
Hogares particulares ocupados con personas presentes	1.232.496	42.638	967
% Hogares con al menos una NBI	43,0	56,2	49,1
% Hogares con NBI en calidad de la vivienda	12,6	19,0	19,0
% Hogares con NBI en infraestructura sanitaria	20,8	29,7	21,5
% Hogares con NBI en acceso a la educación	15,7	20,3	24,5
% Hogares con NBI en capacidad de subsistencia	14,9	19,8	12,5

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012 y Tríptico Necesidades Básicas Insatisfechas (NBI) 2012. Paraguay en base a STP-DGEEC. Censo Nacional de Población y Viviendas 2012.

1.3. Economía

Los datos del Plan Local de Salud con relación a la economía exponen que se basa eminentemente en la explotación forestal, agrícola y ganadera. Sus habitantes se dedican también a la explotación minera y calera, y al comercio. Las fuentes de empleo constituyen además las instituciones públicas y privadas, estancias, aserraderos, entre otros. Los pobladores que viven en las zonas ribereñas como Itakua, Guyrati, Itapukumi se dedican a la caza y a la pesca⁶.

Actividades económicas

Según los datos proveídos por la DGEEC⁷, en el Distrito de San Alfredo predominan las actividades productivas vinculadas al sector primario, posteriormente las del sector secundario y en menor proporción las vinculadas al sector terciario. La siguiente tabla incluye los porcentajes de cada sector en el distrito y a nivel departamental.

Tabla 6. Población ocupada por sector económico

Datos de Población	Departamento de Concepción	Distrito de San Alfredo
Sector económico de la población ocupada ⁸	226.585	4.800
% Primario	40,9	48,9
% Secundario	15,7	30,1
% Terciario	42,2	18,9
% No informado	1,2	2,1

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012.

Datos actualizados (setiembre 2020) facilitados por la DEGEEC ante la solicitud escrita de la empresa Parcel.S.A. en el marco de elaboración del presente estudio.

⁶ Plan Local de Salud de San Alfredo. 2015/2018

⁷ Datos solicitados y proveídos por la DGEEC. Sep.2020.

⁸ Sector Económico de la población ocupada (de 12 años y más de edad que pertenece a una rama de actividad específica), donde el sector primario comprende a la agricultura, ganadería, caza y pesca; el sector secundario abarca las industrias manufactureras, construcción, minas y canteras; el sector terciario agrupa a electricidad, gas y agua, comercio, restaurantes y hoteles, transporte, almacenamiento y comunicaciones, finanzas, seguros, inmuebles, servicios comunales, sociales y personales; y no informado

1.4. Acceso a servicios

En este apartado se presenta contenido relacionado al acceso a servicios en el AID del Proyecto. Se logró contar con información distrital actualizada sobre servicios básicos, educación, formación profesional y técnica, salud, tecnologías de la información y medios de comunicación (TICs) y bienes de confort en cada uno de los distritos involucrados y desde la percepción de los pobladores consultados.

Acceso a Servicios básicos

Según los datos proveídos por la DGEEC, en cuanto a energía eléctrica se puede observar que el 92,3% de las viviendas acceden a este servicio; en relación con el acceso al agua corriente, el 78,7% de las viviendas cuentan con este servicio; el 33,1% se trata de viviendas con saneamiento mejorado. Como puede observarse en la siguiente tabla, es baja o nula la cantidad de viviendas que cuentan con el servicio de recolección de basura. Todos estos datos en la siguiente tabla.

Tabla 7. Viviendas con Acceso a Servicios Básicos

Datos de viviendas particulares Servicios básicos	Departamento de Concepción	Distrito de San Alfredo
Viviendas particulares ocupadas	42.402	966
% Viviendas con energía eléctrica	93,1	92,3
% Viviendas con agua corriente ⁹	74,4	78,7
% Viviendas con desagüe cloacal ¹⁰	6,3	-
% Viviendas con recolección de basura	22,8	0,7
% Viviendas con saneamiento mejorado	46,9	33,1

Fuente: STP/DGEEC. *Censo Nacional de Población y Viviendas, 2012.*

En cuanto a la disposición de residuos sólidos según datos del Plan Local de Salud de San Alfredo, la Municipalidad carece de un vertedero para la disposición y el tratamiento de los residuos sólidos. Los medios de eliminación frecuentemente utilizados por la población son la quema y entierro¹¹.

En relación a los servicios sanitarios, según se indica en la misma fuente, se estima que el 20% de la población del área urbana posee baño moderno, mientras que en el área rural predomina la utilización de letrinas sanitarias.

Educación

Sobre el acceso a la educación en el distrito, los datos del Plan Local de Salud y documentación oficial del Ministerio de Educación y Ciencias indican que los niños y las niñas en su mayoría acceden a los servicios de educación escolar básica, igualmente existen instituciones de educación media, no así instituciones de enseñanza superior.

⁹ Incluye: ESSAP, SENASA, red comunitaria, red privada, y pozo artesiano, con cañería fuera de la vivienda pero dentro del terreno o con cañería hasta la cocina y/o baño.

¹⁰ Incluye: Desagüe por red pública, pozo ciego con y sin cámara séptica.

¹¹ Plan Local de Salud de San Alfredo 2015/2018

Según los datos actualizados del MEC¹², en el distrito se encuentran 12 instituciones educativas, de las cuales 1 se encuentra en el área urbana y 11 en el área rural. Estas imparten enseñanza de nivel inicial, escolar básica y nivel medio como se expone a continuación.

Tabla 8. Nivel educativo por zona

Nivel de enseñanza	Zona		
	Total	Urbana	Rural
Educación inicial	6	1	5
Escolar Básica	8	1	7
Escolar Básica Abierta	1	-	1
Educación media	4	1	3
Total	19	3	16

Fuente: Elaboración en base a datos actualizados del MEC - Datos abiertos, Establecimientos escolares 2019

Es importante aclarar que existen establecimientos que tienen más de una institución y que en las instituciones podrían impartirse más de una modalidad.

De los materiales de consulta también se pudo extraer información relacionada a los servicios con que cuentan las instituciones, como ser el caso de dos escuelas que cuentan con almuerzo escolar durante el año lectivo, a través del apoyo de la Municipalidad; mientras que alumnos de otra institución reciben este mismo servicio a través de la Gobernación de Concepción.

En cuanto al acceso a energía eléctrica, la totalidad cuenta con este servicio por parte de la ANDE y figuran diferentes medios por los cuales estas instituciones cuentan con agua (SENASA, pozo artesiano, pozo común y en su mayoría río).

En términos de problemáticas vinculadas a la educación, se menciona que la población joven no culmina los estudios del nivel medio, debido a que la gran mayoría necesita realizar trabajos remunerados para contribuir al sustento familiar; así como se identifica un bajo acceso a estudios universitarios, teniendo en cuenta además que quienes pueden se trasladan al distrito de Concepción donde se cuenta con universidades, esto con el apoyo de la Municipalidad que facilita el traslado de los jóvenes al centro urbano de Concepción en un minibús. Se dan casos también en que migran a otras ciudades del país en busca de servicios educativos y fuentes de trabajo. La mayoría de la población adulta sabe leer y escribir, existiendo sin embargo personas sin alfabetización¹³.

A continuación, se presenta cada institución educativa y sus características:

Tabla 9. Instituciones Educativas Distrito de San Alfredo por zona, modalidad, acceso a agua y energía

Instituciones Educativas Distrito de San Alfredo	Localidad/Barrio	Zona	Nivel educativo	Agua	Energía
Escuela Básica N° 1731 San Alfredo y Colegio Nacional Laguna Ybycua	San Alfredo	Urbana	E.I., E.E.B., E.M.	SENASA	ANDE
Escuela Básica N° 7149 San Ramón	Asentamiento 8 de Noviembre	Rural	E.I., E.E.B.	Pozo Artesiano	ANDE

¹² MEC - Datos abiertos, Establecimientos escolares – 2019.

¹³ Plan Local de Salud San Alfredo 2015/2018

Escuela Básica N° 1458 Tte. 1° Florencio Fernández	Isla Peña Hermosa	Rural	E.E.B.	Río	ANDE
Escuela Básica N° 520 Fortín Boquerón y Colegio Nacional Puerto Fonciere	Puerto Fonciere	Rural	E.I., E.E.B., E.M.	Río	ANDE
Escuela Básica N° 6688 Santa María	Santa María	Rural	E.E.B.	Pozo Común	ANDE
Escuela Básica N° 2744 Caleria Guyrati y Colegio Nacional Guyrati	Caleria Guyrati	Rural	E.I., E.E.B., E.M.	Río	ANDE
Escuela Básica N° 1983 y Colegio Nacional Itakua	Itakua	Rural	E.I., E.E.B., E.M.	Río	ANDE
Escuela Básica N° 6923 8 de Noviembre	Asentamiento 8 de Noviembre	Rural	E.I., E.E.B., E.B.A.	Pozo artesiano	ANDE
Escuela Básica N° 1461 8 de Diciembre	Itapucumi	Rural	E. I., E.E.B.	Río	ANDE

Fuente: Elaboración en base a los datos del MEC- Datos abiertos, Establecimientos escolares 2019 y la Guía Completa de Educación en Paraguay.

Salud

En el Plan Local de Salud se hace referencia a que en la zona son frecuentes las enfermedades respiratorias, trastornos por hipertensión arterial, diabetes, enfermedades pulmonares, tabaquismo, parasitosis, entre otros y se cuenta con los siguientes centros asistenciales en el distrito:

- Unidad de Salud de la Familia (USF) de San Alfredo y
- Unidad de Salud de la Familia (USF) de Itakua/ Calería Ita Cua.
- Asimismo, fueron habilitados dos dispensarios médicos para la adquisición de medicamentos¹⁴.



USF San Alfredo- Fuente: Concepción al Día¹⁵

A través de las USFs, la población accede a los servicios de consultorio clínico, odontológico, provisión de leche a embarazadas y niños/as con bajo peso, control pre natal, test para recién nacidos, detección temprana de ITS, control de enfermedades infecto contagiosas en general, entre otras. En cuanto al acceso a vacunaciones, se presta asistencia solo en la USF de San Alfredo.

¹⁴ Plan Local de Salud de San Alfredo 2015/2018

¹⁵ Disponible en: <http://www.concepcionaldia.com/nuevos-distritos-sin-ambulancia/>

En el Plan se hace alusión, además, al hecho de que los pobladores ante necesidades de asistencia, acuden inicialmente a médicos naturalistas y parteras empíricas (una práctica arraigada en la zona) y si no encuentran mejoría acuden posteriormente a ser atendidos por los profesionales de salud. En la comunidad se cuenta con 6 médicos naturalistas, 3 parteras empíricas y los profesionales que conforman la USF de San Alfredo: 1 médico, 1 licenciada en Enfermería, 1 licenciada en Obstetricia, 1 Odontóloga que presta servicios en forma voluntaria, 2 auxiliares en enfermería, 3 agentes comunitarios y 1 personal de servicio (pagado por los funcionarios de la unidad); en la USF de Itakua cuentan con 1 médico, 1 licenciada en obstetricia, 1 licenciada en enfermería, 1 auxiliar técnica y 1 personal de servicio (pagado por el Consejo de Salud).

Acceso a Tecnologías de información y medios de comunicación (TIC) y bienes de confort

A través de los datos facilitados por la DGEEC, en relación al acceso de la población a las TICs puede afirmarse que en la gran mayoría de viviendas en el Distrito de San Alfredo se cuenta con radio, igualmente teléfonos celulares y televisor; no ocurre lo mismo con las antenas parabólicas, las computadoras, tv cable, internet y teléfono fijo, que como puede observarse en la siguiente tabla, obtuvieron porcentajes mucho menores a las tecnologías citadas inicialmente.

Tabla 10. Equipos domésticos y TICs

Acceso a TIC	Departamento de Concepción	Distrito de San Alfredo
Viviendas particulares ocupadas	42.402	966
% Viviendas con radio	80,6	90,4
% Viviendas con televisor	79,8	81,3
% Viviendas con teléfono fijo	8,0	0,8
% Viviendas con teléfono celular	83,3	86,2
% Viviendas con computadora	11,9	2,2
% Viviendas con computadora conectada a internet	9,2	1,2
% Viviendas con antena parabólica	10,8	9,0
% Viviendas con TV cable	13,4	1,6

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012.

La DGEEC facilitó igualmente información sobre el acceso de la población del distrito de San Alfredo a los bienes de confort en las viviendas, exponiendo que la gran mayoría cuenta con motocicletas, seguido de viviendas que cuentan con heladera y lavarropas. Finalmente, y con mucha diferencia, viviendas que cuentan con video/DVD; horno microondas, automóvil, ducha eléctrica y termo-calefón.

Tabla 11. Equipos domésticos y Bienes de confort

Bienes de confort	Departamento de Concepción	Distrito de San Alfredo
Viviendas particulares ocupadas	42.402	966
% Viviendas con heladera	68,1	65,0
% Viviendas con lavarropas	50,9	30,1
% Viviendas con video/DVD	21,2	15,0
% Viviendas con termo-calefón	4,0	1,4

Bienes de confort	Departamento de Concepción	Distrito de San Alfredo
% Viviendas con ducha eléctrica	25,7	3,6
% Viviendas con acondicionador de aire	15,2	3,7
% Viviendas con horno microondas	14,4	6,9
% Viviendas con automóvil/camioneta	9,9	4,1
% Viviendas con moto	74,3	74,2

Fuente: STP/DGEEC. *Censo Nacional de Población y Viviendas, 2012*

2. Distrito de Sargento José Félix López

2.1. Características generales



El camino que une a la comunidad con el km 70 de la ruta 5 Bernardino Caballero tiene una longitud de 120 km. Concepción Noticias (2017)¹⁶

Según los datos del Plan de Desarrollo Sustentable, el municipio Sargento José Félix López fue conformado oficialmente el 7 de setiembre de 2011 por Ley N°4.418, separándose su territorio del distrito de Concepción. Abarca la superficie de 224.428 hectáreas, con 8.544 metros cuadrados. Se encuentra ubicado al noreste, a 200 km de la capital departamental y a 700 km al norte de la ciudad de Asunción. Al norte limita con Brasil, teniendo como frontera al Rio Apa, que se encuentra a 20 km; al este limita con el distrito de Bella Vista norte

del departamento de Amambay, a aproximadamente 75 km; al oeste limita con el distrito de San Carlos del Apa, a unos 50 km.

El acceso al municipio se realiza por vía terrestre por la Ruta V hasta el km. 70, para luego seguir por el tramo-calle 15 hasta la Colonia Jorge Sebastián Miranda (Hugua Ñandu), del distrito de Paso Barreto, y se debe recorrer unos 70 km. más por camino enripiado hasta llegar al área urbana del distrito. Los caminos de tierra suelen permanecer en mal estado durante los días de lluvia.

Las personas entrevistadas durante el trabajo de campo resaltaron que “hay tranquilidad”, que la gente “es solidaria y se conocen entre todos en la comunidad”, que hay mucha naturaleza y bosques nativos en la zona, que no existe contaminación, se cuenta con un arroyo llamado Amambay. Asimismo, que se trata de una zona en la que hay producción agrícola para autoconsumo y que cuentan con lo necesario para el consumo local.

Las festividades tradicionales en Sargento José Félix López, mencionadas durante el relevamiento de información en campo son las fiestas patronales (junio), fiesta de aniversario de la distritación, desfile estudiantil, festivales, entre ellos el principal denominado “Paso Bravo” (edición decimocuarta) que generalmente cuenta con la participación de artistas de otras ciudades. En cuanto a actividades recreativas y de esparcimiento, fueron nombradas carrera de caballo y jineteada, ferias de comidas, campeonatos de fútbol tanto masculino como femenino, y otros deportes, actividades de la parroquia organizadas por jóvenes de la zona.

Asimismo, en las escuelas se organizan campeonatos deportivos, olimpiadas educativas, e intercambios inter-escolares. Desde la USF se realizan charlas con adultos mayores, club de embarazadas y de padres.

¹⁶ Disponible en: <http://www.concepcion-py.com/2017/07/mal-estado-vial-entorpece-el-desarrollo.html>

2. Datos de Población

Para este apartado, los datos fueron obtenidos de la DGEEC, el Plan Local de Salud y el Plan de Desarrollo Sustentable Municipal; estos últimos elaborados por la Municipalidad de Sargento José Félix López.



Desfile Aniversario de Distritación- Fuente: Última Hora (2019)¹⁷

Según datos de la DGEEC, la población del Departamento de Concepción es de 254.976 habitantes, de los cuales 7.242 habitantes pertenecen al Distrito de Sargento José Félix López, es decir, el 2,84% de dicha población.

Como puede observarse en la siguiente tabla, la población está conformada por 3.784 hombres (52,25%) y 3.459 mujeres (47,76%) (Proyección 2020)¹⁸, cantidad que corresponde al 2.84% de la población del departamento de Concepción.

Tabla 12. Proyección de la población del Distrito de Sargento José Félix López por sexo. Año 2020

Sargento José Félix López	Población	Porcentajes
Hombres	3.784	52,25
Mujeres	3.459	47,76
Total (ambos sexos)	7.242	100
% Población Total del Departamento	254.976	2,84

Fuente: Elaboración propia en base a datos de la DGEEC. Dpto. Concepción. Población estimada y proyectada, según distrito, sexo y grupos de edad, 2000-2025

Igualmente, atendiendo a las cifras respecto a la evolución/crecimiento de la población, puede notarse que la diferencia en la relación cantidad hombres/mujeres se mantiene y que en los últimos 5 años no hubo una variación muy importante en términos de crecimiento poblacional en el distrito, según las proyecciones elaboradas por la DGEEC.

¹⁷ Disponible en: <https://www.ultimahora.com/puentesino-celebra-ocho-anos-distritacion-un-desfile-n2842715.html>

¹⁸ DGEEC. Dpto. Concepción. Población estimada y proyectada, según distrito, sexo y grupos de edad, 2000-2025.

Tabla 13. Evolución de la población de Sargento José Félix López en los últimos 5 años (2016-2020)

Evolución de la Población Distrital por sexo	2016	2017	2018	2019	2020
Hombres	3.665	3.695	3.725	3.755	3.784
Mujeres	3.259	3.308	3.358	3.408	3.459
Población total	6.924	7.003	7.083	7.163	7.242

Fuente: DGEEC. Dpto. Concepción. Población estimada y proyectada, según distrito, sexo y grupos de edad, 2000-2025

En la siguiente tabla puede observarse que existe una disminución de la población del Distrito de Sargento José Félix López en relación a lo proyectado en la tabla anterior para el año 2020 (según datos suministrados por la DGEEC).

Tabla 14. Evolución de la población en los siguientes 5 años (2020-2025)

Departamento y distrito	Año					
	2020	2021	2022	2023	2024	2025
Dpto. Concepción	254.976	258.653	62.360	266.072	269.805	273.579
Sargento José Félix López	7.087	7.144	7.202	7.258	7.314	7.369

Fuente: STP/DGEEC. Paraguay. Proyección de la población por sexo y edad, según distrito, 2000-2025. Revisión 2015

Por su parte, el documento del Plan Local de Salud indica que la población total es de aproximadamente de 10.000 habitantes según los registros de la Municipalidad, con una densidad poblacional de 22 personas por hectárea; el 30% de la población reside en la zona urbana y el 70% reside en la zona rural¹⁹.

Tabla 15. Población por zona Urbana y Rural

Sargento José Félix López	Población	Porcentaje
Área urbana	3.000	30%
Área rural	7.000	70%
Total	10.000	100%

Fuente: Elaboración propia con datos del Plan Local de Salud 2015/2018.

El territorio distrital cuenta con 9 barrios en la **zona urbana**: Santa Ana, San Clemente, La Suerte, Piri Poty, Unión, Yvype, Porvenir, Ara Poty, Loma Pyta y 4 asentamientos en la **zona rural**, que a su vez se divide en barrios, calles, líneas, y zonas. Los Asentamientos son: Norte Pyahú (que se divide nuevamente en los siguientes barrios: Cerrito, Hermosa, Vya Renda, Kurusu Eva, Calle 1, Calle 13 y Calle 14), Yvy Maraney (dividido en San Francisco, San Antonio, 3 Lomas, San Roque, San Cayetano), 29 de Junio (se divide en Calles: Calle 2, 3, 4, 6, 7, 8, 11, 12; Sótano, 1ª Línea, 2ª Línea, 3ª Línea, Ruta San Carlos, Arroyo Mborevikua) y Calle 4 (se divide en 1ª Zona, 2ª Zona y Curupayty)²⁰.

Población Indígena

En el distrito de Sargento José Félix López, según datos de la DGEEC, obtenidos en el III Censo Nacional de Población y Viviendas para pueblos Indígenas 2012, existe 1 comunidad indígena llamada Takuarita, perteneciente al Pueblo Mbya Guaraní, conformada por 142 habitantes, 72

¹⁹ CIRD y MSPyBS. Plan Local de Salud de Sargento José Félix López. 2015-2018.

²⁰ CIRD y MSPyBS. Plan Local de Salud de Sargento José Félix López. 2015-2018.

hombres y 70 mujeres, distribuidos en 30 viviendas particulares y colectivas, en el área rural²¹. De la totalidad de la población del distrito (7242), el 1,96% corresponde a la mencionada comunidad indígena, siendo en su mayoría, hombres con el 50,70% y mujeres con el 49,30%.

Tabla 16. Población indígena de Sargento José Félix López, por sexo. Año 2012

Distrito de Sargento José Félix López	Población Indígena	Porcentajes
Hombres	72	50,70
Mujeres	70	49,30
Total (ambos sexos)	142	1,96
% Población del Distrito	7.242	2,84
% Población Total del Departamento	254.976	100

Fuente: Elaboración propia en base a datos de la DGEEC. III Censo Nacional de Población y Viviendas para pueblos Indígenas por Departamento 2012.

Hogares, vivienda

Otros datos proveídos por la DGEEC en relación a la condición de propiedad de la vivienda en el distrito indican que en este existen 1.221 viviendas particulares ocupadas precensadas, resultando ampliamente mayoritaria la población que cuenta con vivienda propia, seguida de la condición de “prestada” o quienes las habitan como “encargados”²², y en menor cantidad, viviendas alquiladas, condición de ocupación de hecho o en condominio. Los porcentajes pueden observarse en la siguiente tabla.

Tabla 17. Condición de propiedad de la vivienda

Condición de propiedad de la vivienda	Departamento de Concepción	Distrito de Sargento José Félix López
Viviendas particulares ocupadas con personas presentes	42.402	1.221
% Es propia	85,2	82,0
% La están pagando en cuotas	0,9	-
% Es en condominio	0,4	0,4
% Es alquilada	5,1	1,7
% Es prestada, la cuidan	7,5	15,3
% Es ocupada de hecho	0,8	0,5
% No informado	0,1	0,1

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012.

Necesidades Básicas Insatisfechas (NBI)

En el Distrito de Sargento Félix López, según datos de la DGEEC, tanto en el tríptico sobre NBI²³ como en los datos proveídos por ésta en el marco de elaboración del presente estudio²⁴ sobre

²¹ [DGEEC. Concepción: Población indígena por sexo y cantidad de viviendas particulares y colectivas según área, distrito, comunidad, aldea o barrio y núcleo de familia y pueblo, 2012.](https://www.dgeec.gov.py/default.php?publicacion=33) Disponible en: <https://www.dgeec.gov.py/default.php?publicacion=33>

²² DGEEC. Censo 2012 disponible en <https://www.dgeec.gov.py/vt/Indicadores-distritales.php>

²³ DGEEC. Necesidades Básicas Insatisfechas (NBI) 2012 PARAGUAY. Disponible en: <https://www.dgeec.gov.py/Publicaciones/Biblioteca/investigacion%20tematica/Triptico-de-necesidades-insatisfechas-NBI-2012.pdf>

²⁴ Datos solicitados y proveídos por la DEGECC, Sep. 2020.

Medición de las NBI a partir del Censo Nacional de Población y Viviendas 2012, se indica que el 89,4% de los hogares del distritos tienen al menos una NBI; siendo en el AID el distrito con mayor porcentaje en dicho tema, como puede observarse en la siguiente tabla, sobre todo en lo referente a los hogares con NBI en infraestructura sanitaria, en capacidad de subsistencia, en acceso a la educación y en calidad de la vivienda.

Tabla 18. Hogares con NBI, según departamento y distrito

Indicadores de Necesidades Básicas Insatisfechas (NBI) (%)	Total hogares	Departamento de Concepción	Distrito Sargento Félix López
Hogares particulares ocupados con personas presentes	1.232.496	42.638	1.221
% Hogares con al menos una NBI	43,0	56,2	89,4
% Hogares con NBI en calidad de la vivienda	12,6	19,0	24,5
% Hogares con NBI en infraestructura sanitaria	20,8	29,7	82,9
% Hogares con NBI en acceso a la educación	15,7	20,3	26,3
% Hogares con NBI en capacidad de subsistencia	14,9	19,8	37,5

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012 y Tríptico Necesidades Básicas Insatisfechas (NBI) 2012. Paraguay en base a STP-DGEEC. Censo Nacional de Población y Viviendas 2012.

2.3. Economía

Actividades económicas

En cuanto a las actividades económicas, se afirma que el distrito es eminentemente ganadero y que existen numerosos establecimientos ganaderos en dicha zona. Asimismo, sus habitantes se dedican a la explotación forestal y agrícola, esta última en menor escala debido a la falta de caminos y al bajo precio de los productos en el mercado local y regional, aspectos que limitan la producción a gran escala o para comercialización. Actualmente puede decirse que la agricultura es más que nada para autoconsumo. La población también se dedica a las actividades comerciales y a la prestación de servicios profesionales en instituciones públicas y privadas, aserraderos y las estancias²⁵.



Registro fotográfico de trabajo de campo. Equipo consultor. Concepción. Agosto -septiembre 2020.

En cuanto a la comunidad indígena de Takuarita, podría decirse que las actividades de subsistencia están basadas en la recolección, caza y pesca²⁶.

²⁵ Plan Local de Salud de Sargento José Félix López (Puentesíño) periodo 2015-2018

²⁶ Atlas Comunidades Indígenas del Paraguay año 2012.

Tabla 19. Actividades económicas por sector

Actividades económicas	Sargento José Félix López		
	Primario	Secundario	Terciario
	Ganadería, Explotación forestal, Agrícola Aserraderos Caza y Pesa (comunidad indígena)	Actividades comerciales	Prestación de servicios profesionales en instituciones públicas y privadas

Fuente: Elaboración propia con datos de la Municipalidad 2020 y el Plan Local de Salud de Sargento José Félix López. 2015/2018.

Durante el trabajo de campo las personas entrevistadas comentaron respecto a las principales actividades económicas del distrito mencionando las siguientes:

- Trabajo en estancias como mensuales y jornaleros.
- Hay personas que se dedican a changas, realizan actividades de manera esporádica, por día o por trabajo específico.
- Producción ganadera de pequeña y gran escala.
- En cuanto a comercio, se cuenta con despensas, ferretería, talleres de vehículos (con muchos vehículos abandonados por la facilidad de compra sin documentación legal), comedores, lugares de alojamiento, también aserraderos (madera para exportar) y carpintería.
- En la producción agrícola, los rubros de renta son el maíz y sésamo (1 cosecha al año), el maíz tupi pytã se vende a una estancia de la zona para alimento de animales. Hay además producción de maní, zapallo, mandioca, batata, éstos son comercializados en la Ciudad de Puentesíño principalmente.
- Actualmente hay empresas que trabajan en obras viales.
- Empleados del Estado.

Como puede observarse en la siguiente tabla con información proveída por la DGEEC²⁷, respecto a los sectores económicos, en el Distrito de Sargento José Félix López predomina el sector primario, seguido por el sector terciario y en menor proporción el secundario.

Tabla 20. Población ocupada por sector económico

Datos de Población	Departamento de Concepción	Distrito de Sargento José Félix López
Sector económico de la población ocupada ²⁸	226.585	6.610
% Primario	40,9	72,9
% Secundario	15,7	9,8
% Terciario	42,2	16,3
% No informado	1,2	0,9

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012.

²⁷ Datos solicitados y proveídos por la DGEEC. Sep. 2020.

²⁸ **Sector Económico de la población ocupada:** Población ocupada de 12 años y más de edad que pertenece a una rama de actividad específica, donde el *sector primario* comprende a la agricultura, ganadería, caza y pesca; el *sector secundario* abarca las industrias manufactureras, construcción, minas y canteras; el *sector terciario* agrupa a electricidad, gas y agua, comercio, restaurantes y hoteles, transporte, almacenamiento y comunicaciones, finanzas, seguros, inmuebles, servicios comunales, sociales y personales; y no informado.

2.4. Acceso a servicios

Servicios Básicos

En lo referente a acceso a servicios básicos, en el Distrito de Sargento José Félix López, según los datos proveídos por la DGEEC²⁹, se cuenta con energía eléctrica, agua corriente y saneamiento mejorado. A continuación, se presenta la información en porcentajes, y su vinculación con las cifras de nivel departamental.



ANDE Puentesíño

Sistema de Agua Centro Puentesíño

Fuente: Registro fotográfico de trabajo de campo. Equipo consultor. Concepción. Agosto -Septiembre 2020

Tabla 21. Viviendas con Acceso a Servicios Básicos

Datos de viviendas particulares Servicios básicos	Departamento de Concepción	Distrito de Sargento José Félix López
Viviendas particulares ocupadas	42.402	1.221
% Viviendas con energía eléctrica	93,1	73,1
% Viviendas con agua corriente ³⁰	74,4	59,9
% Viviendas con desagüe cloacal ³¹	6,3	-
% Viviendas con recolección de basura	22,8	0,1
% Viviendas con saneamiento mejorado	46,9	6,8

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012.

En el Plan Local de Salud del distrito se menciona que se tiene acceso a servicios básicos, gran parte de la zona urbana y rural cuenta con el servicio de energía eléctrica, excepto las comunidades de: 29 de Junio, Sótano, 1ª Zona, 2ª Zona y Curupayty, que esperan la ampliación del tendido eléctrico. En las compañías, la mayoría de la población accede al servicio de agua potable, otras utilizan agua de pozo (La mayoría de los pobladores utiliza agua de pozo artesiano), arroyos y tajamares para su abastecimiento³².

²⁹ Datos solicitados y proveídos por la DGEEC. Sep. 2020.

³⁰ Incluye: ESSAP, SENASA, red comunitaria, red privada, y pozo artesiano, con cañería fuera de la vivienda pero dentro del terreno o con cañería hasta la cocina y/o baño.

³¹ Incluye: Desagüe por red pública, pozo ciego con y sin cámara séptica.

³² CIRD y MSPyBS. Plan Local de Salud Sargento José Félix López (Puentesíño) periodo 2015-2018

Las Juntas de Saneamiento se encuentran funcionando en las comunidades de La Suerte, San Clemente, Unión, Loma Pyta, Yvype Santa Ana, Yvy Maraney, Sótano, Calle 4, Calle 3, 29 de Junio y Norte Pyahú. Las personas entrevistadas en el marco del presente estudio afirmaron que se cuenta con sistemas de agua vía SENASA, también se utilizan tajamares, el arroyo, pozos comunes e incluso agua de lluvia. Se comentó además, sobre zonas donde no hay agua, como en el caso de calle 7, Norte Pyahu y calle 3, “se cavaron tres pozos con más de 100 metros y no se encontró agua”. Asimismo, hablaron de la existencia de por lo menos 10 juntas de agua y saneamiento en la zona.

Por su parte, en la comunidad Indígena de Takuarita no cuentan con el servicio de luz eléctrica, utilizan lámparas, velas y candiles como las formas más comunes de alumbrar por las noches³³.

En cuanto a la disposición de residuos sólidos, la Municipalidad ha dispuesto un lugar para el depósito de los mismos, pero todavía no se cuenta con el servicio de recolección. Los pobladores queman o entierran actualmente sus desechos domiciliarios.

Otro aspecto importante para la salud es la utilización de sanitarios. La mayoría de las viviendas dispone de letrinas sanitarias, por tanto, pocas cuentan con baño moderno.

Educación

En cuanto al tema de acceso a la educación, en el Plan Local de Salud del distrito se plantea que en la población en edad escolar se registra alta matriculación, la mayoría de los/as niños/as accede a la educación escolar básica, reciben almuerzo y merienda escolar en sus respectivas escuelas³⁴.

Según datos del Ministerio de Educación y Ciencias³⁵, en el Distrito Sargento José Félix López existen 27 instituciones educativas, de las cuales, 19 se encuentran en el área rural (1 en la Estancia Buenaventura, privada subvencionada y 1 en la Comunidad Indígena Takurita), y 8 en el área urbana, una es la sede de la Supervisión Administrativa y Pedagógica Región en la cual también se imparte enseñanza. De la totalidad de instituciones en el área rural, todas tienen modalidad de Educación Escolar Básica y en el área urbana 7 son con modalidad de Educación Escolar Básica y 3 con Modalidad de Educación Media.



Escuela N° 1800 Puentesño

Fuente: Registro fotográfico de trabajo de campo. Equipo consultor. Concepción. Agosto -septiembre 2020.

³³ Atlas Comunidades Indígenas del Paraguay año 2012.

³⁴ Plan Local de Salud Sargento José Félix López (Puentesño) periodo 2015-2018.

³⁵ MEC. Disponible en: https://datos.mec.gov.py/data/establecimientos_escolares_priorizados_elegibles_fonacide

Tabla 22. Nivel educativo según zona de ubicación

Nivel de enseñanza	Total	Zona	
		Urbana	Rural
Escolar Básica	26	7	19
Educación media	3	3	-
Total	29	10	19

Fuente: Elaboración en base a datos actualizados del MEC - Datos abiertos, Establecimientos escolares 2019

Es importante aclarar que existen establecimientos que tienen más de una institución y que en las instituciones podrían impartirse más de una modalidad.

En cuanto a acceso a servicios básicos de estas instituciones, 17 de ellas cuentan con energía eléctrica a través de la ANDE y 14 acceden al servicio de agua por parte de SENASA, 4 a través de un tajarar y 2 se abastecen desde arroyos.

En relación a la educación superior, en el distrito no se cuenta con universidades, sin embargo, para algunos jóvenes se hace posible asistir a éstas, a través de la Municipalidad de Sargento José Félix López que les otorga becas de estudio.

A continuación, se presenta cada institución educativa y sus características.

Tabla 23. Instituciones educativas de Sgto. José Félix López por zona, modalidad, acceso a agua y energía

Instituciones Educativas de Sgto. José Félix López	Localidad/Barrio	Zona	Asentamiento o Colonia	Modalidad	Agua	Energía
Escuela Básica N° 1800 Gral Bernardino Caballero	B° San Clemente	Urbana	Puentesíño	E.E.B.	SENASA	ANDE
Colegio Nacional San Clemente María	B° San Clemente	Urbana	Puentesíño	E.E.B. y E.M.	SENASA	ANDE
Supervisión Administrativa y Pedagógica Región 7	B° San Clemente	Urbana	Puentesíño	E.E.B. y E.M.	-	-
Escuela Básica N° 8049 Hilario Sánchez	B° La Suerte	Urbana	Puentesíño	E.E.B.	SENASA	ANDE
Escuela Básica N° 2322 Mcal. Francisco Solano López	B° Loma Pyta	Urbana	Puentesíño	E.E.B.	SENASA	ANDE
Escuela Básica N° 2321 San Miguel	B° Piri Poty	Urbana	Puentesíño	E.E.B.	SENASA	ANDE
Escuela Básica N° 2320 Independencia Nacional y Colegio Nacional Independencia Nacional	B° Yvype	Urbana	Puentesíño	E.E.B. y E.M.	SENASA	ANDE
Escuela Básica N° 7203 Héroes de Acosta Ñu	Asentamiento	Rural	Calle 3	E.E.B.	SENASA	ANDE
Escuela Básica N° 7200 Mártires de Acosta Ñu	Asentamiento	Rural	Marane y Jevika	E.E.B.	Tajarar	ANDE
Escuela Básica N° 7201 Guavirami	Asentamiento	Rural	Marane y	E.E.B.	Tajarar	ANDE
Escuela Básica N° 4667 San Francisco	Asentamiento	Rural	Marane y	E.E.B.	Tajarar	ANDE
Escuela Básica N° 4666 Río Apa	Asentamiento	Rural	Norte Pyahu	E.E.B.	SENASA	ANDE

Instituciones Educativas de Sgto. José Félix López	Localidad/Barrio	Zona	Asentamiento o Colonia	Modalidad	Agua	Energía
Escuela Básica N° 4665 15 De Agosto	Asentamiento	Rural	Norte Pyahu	E.E.B.	SENASA	ANDE
Escuela Básica N° 7202 Niño Jesús	Asentamiento	Rural	B° Hermosa	E.E.B.	SENASA	ANDE
Escuela Básica N° 6844 Itaky	Asentamiento	Rural	Calle 2	E.E.B.	Arroyo	No
Escuela Básica N° 7199 13 de diciembre	Asentamiento	Rural	Vy a Renda	E.E.B.	SENASA	No
Escuela Básica N° 6880 San Miguel	Asentamiento	Rural	Calle 6	E.E.B.	SENASA	ANDE
Escuela Básica N° 4662 Arroyo Ita	Asentamiento	Rural	Calle 7	E.E.B.	Arroyo	ANDE
Escuela Básica N° 8204 San Rafael	Asentamiento	Rural	San Rafael	E.E.B.	SENASA	ANDE
Escuela Básica N° 6843 Kurusu Eva	Asentamiento	Rural	Kurusu Eva	-	-	-
Escuela Básica N° 4663 Sotano	Asentamiento	Rural	Sotano	-	-	-
Escuela Básica N° 4664 13 de enero	Asentamiento	Rural	Calle 3	-	-	-
Escuela Básica N° 6842 San Juan	Asentamiento	Rural	Calle 8	-	-	-
Escuela Básica N° 6840 Santa Ana	B° Santa Ana	Rural	Puentesiño	E.E.B.	SENASA	ANDE
Escuela Básica N° 6292 Takuarita	Takuarita	Rural	Takuarita	E.E.B.	Tajamar	No
Escuela Básica N° 6839 Humberto Camperchioli	Puentesiño	Rural	Estancia	-	-	-

Fuente: elaboración en base a los datos del MEC- Datos abiertos, Establecimientos escolares 2019 y la Guía Completa de Educación en Paraguay.

Formación profesional y técnica

La municipalidad de Sargento José Félix López, según se indica en las fuentes consultadas, también pone a disposición de la población capacitaciones en oficios, tales como carpintería, albañilería, electricidad, plomería, fontanería, cocina, peluquería, entre otros, a fin de mejorar los ingresos y la calidad de vida de sus familias³⁶.

Según esta fuente, los adultos en su mayoría saben leer y escribir. Funcionan en el distrito centros de alfabetización de adultos. Algunos son beneficiados con la pensión no contributiva que ofrece el Ministerio de Hacienda³⁷.

Según publicaciones del Servicio Nacional de Promoción Profesional (SNPP), en Sgto. José Félix López, más de 100 jóvenes y adultos del distrito concluyeron su formación en Electricidad domiciliaria (60) y Ayudante Albañilería (50) en el Asentamiento Norte Pyahu, mediante una

³⁶ MEC. Disponible en: https://datos.mec.gov.py/data/establecimientos_escolares_priorizados_elegibles_fonacide

³⁷ ídem

de sus aulas móviles, con el respaldo de la Secretaría Nacional de la Vivienda y el Hábitat (SENAVITAT).³⁸

Salud

En lo relacionado a aspectos vinculados al acceso a la salud, inicialmente se hace referencia a las enfermedades más frecuentes en la zona. En el Plan Local de Salud de Sargento José Félix López se citan a enfermedades respiratorias, gastrointestinales y dermatológicas, parasitosis, enfermedades crónicas no transmisibles (diabetes, hipertensión, tumores, arteriosclerosis) y problemas bucodentales³⁹.

Asimismo, se hace alusión a que tanto la Municipalidad como la USF apoyan a técnicos del Servicio Nacional de Erradicación del Paludismo (SENEPA) para llevar a cabo trabajos en las comunidades, consistentes en visitas casa por casa y difusión radial de informaciones, fumigación, búsqueda y eliminación de criaderos, identificación de síntomas relacionados a la vigilancia de chagas, dengue y leishmaniasis y campañas de prevención.



USF Puentesíño

Fuente: Registro fotográfico de trabajo de campo. Equipo consultor. Concepción. Agosto -septiembre 2020.

Igualmente, se desarrollan otras actividades a nivel comunitario: charlas educativas en escuelas y colegios, difusión de informaciones a través de programas radiales, visitas domiciliarias para vacunación y seguimiento a embarazadas, adultos mayores, personas con diabetes, entre otros grupos que requieren cuidados específicos.

Las instituciones de servicio público de salud existentes en el municipio, según los datos del plan Local de Salud⁴⁰ son las mencionadas a continuación, se cuenta, además, con 2 farmacias privadas.

- ✓ USF de Puentesíño
- ✓ Puesto Satélite Yvype
- ✓ Puesto Satélite Yvy Maraney
- ✓ Puesto Satélite 29 de Junio y
- ✓ Puesto Satélite Norte Pyahu

En la comunidad indígena de Takuarita no cuentan con instituciones de servicios de salud⁴¹.

En cuanto a los profesionales con quienes se cuenta, según el Plan Local de Salud, la USF de Puentesíño (establecimiento de cabecera del distrito) ofrece asistencia a través de: 1 médico (Director), 3 licenciadas en enfermería, 1 auxiliar, 2 personales administrativos y 1 personal de servicio (limpiadora), no cuenta con laboratorio, el centro de referencia es el Hospital Regional de Concepción⁴².

³⁸ SNPP (2017). Disponible en: <https://www.snpp.edu.py/noticias-snpp/12035-pobladores-de-ex-puentesio-aprendieron-oficios-a-trav%C3%A9s-del-snpp.html>

³⁹ MSPyBS –CIRD (2015). Plan Local de Salud Sargento José Félix López (Puentesíño) periodo 2015-2018.

⁴⁰ MSPyBS –CIRD (2015). Plan Local de Salud Sargento José Félix López (Puentesíño) periodo 2015-2018.

⁴¹ DGEEC. III Censo Nacional de Población y Viviendas para Pueblos Indígenas 2012.

⁴² MSPyBS –CIRD (2015). Plan Local de Salud Sargento José Félix López (Puentesíño) periodo 2015-2018.

Acceso a Tecnologías de información y medios de comunicación (TIC) y bienes de confort

En relación al acceso a las TICs, según los datos facilitados por la DGEEC, en el Distrito de Sargento José Félix López, una gran mayoría de viviendas cuenta con radio; seguido de teléfonos celulares y televisor; y en menor proporción, viviendas que cuentan con antenas parabólicas, tv cable, computadora, teléfono fijo e internet. Los porcentajes se presentan en la siguiente tabla, relacionando éstos con los del nivel departamental.

Tabla 24. Equipos domésticos y TIC

Acceso a TIC	Departamento de Concepción	Distrito de Sargento José Félix López
Viviendas particulares ocupadas con personas presentes	42.402	1.221
% Viviendas con radio	80,6	86,2
% Viviendas con televisor	79,8	48,2
% Viviendas con teléfono fijo	8,0	1,1
% Viviendas con teléfono celular	83,3	79,4
% Viviendas con computadora	11,9	1,2
% Viviendas con computadora conectada a internet	9,2	0,6
% Viviendas con antena parabólica	10,8	11,8
% Viviendas con TV cable	13,4	2,4

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012.

Igualmente, en terreno, las personas comentaron respecto a la existencia de emisoras radiales; radios evangélicas, radios comunitarias (Radio Itaky FM 98.8, Radio Activa y Radio Más), canales de televisión, canales por cable, internet (mala conexión en algunos casos) y celulares.

En relación a los bienes de confort, según datos proveídos por la DGEEC en el marco del presente estudio, puede afirmarse que en la mayoría de las viviendas se cuenta con motocicletas, igualmente, pero en menor proporción, heladeras, lavarropas y video/DVD. Con porcentajes bajos en acceso, viviendas con ducha eléctrica, automóvil/camioneta, horno microondas, aire acondicionado y termo-calefón. Las cifras vinculadas se presentan en la siguiente matriz, así como porcentajes de acceso a dichos bienes a nivel departamental.

Tabla 25. Equipos domésticos y Bienes de confort

Bienes de confort	Departamento de Concepción	Distrito de Sargento José Félix López
Viviendas particulares ocupadas con personas presentes	42.402	1.221
% Viviendas con heladera	68,1	48,2
% Viviendas con lavarropas	50,9	29,6
% Viviendas con video/DVD	21,2	10,8
% Viviendas con termo calefón	4,0	1,1
% Viviendas con ducha eléctrica	25,7	4,2
% Viviendas con acondicionador de aire	15,2	2,0
% Viviendas con horno microondas	14,4	3,2
% Viviendas con automóvil/camioneta	9,9	4,4

Bienes de confort	Departamento de Concepción	Distrito de Sargento José Félix López
% Viviendas con moto	74,3	80,7

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012.

3. Distrito de Bella Vista Norte

3.1. Características generales



Río Apa Bella Vista Norte- Fuente: Bienvenido Paraguay⁴³

El Distrito de Bella Vista Norte posee una extensión de 3.901 Km, se encuentra ubicado al extremo noreste de la Región Oriental, a 469 km de Asunción y 150 km de Pedro Juan Caballero, su principal acceso es la Ruta Nacional N°3 Gral. Elizardo Aquino. Al norte y este limita con la República Federativa del Brasil, separado por el Río Apa y la Cordillera de Amambay; linda al sur con Canindeyú y al oeste con Concepción y San Pedro⁴⁴.

Según los datos del Plan de Desarrollo Municipal (2016)⁴⁵, en el año 1.851 se fundó la localidad de Villa Bella. Desde el año 1.860 la zona donde hoy se asienta comenzó a poblarse y durante el gobierno de Héctor Carvalho, tomó como nombre Bella Vista Norte y fue elevada a la categoría de Municipio. Pero recién en 1.901 fue creado el municipio de Bella Vista Norte, en virtud de un decreto del presidente Emilio Aceval. Según historiadores, la misma sería la localidad más antigua del Departamento.

Además, el nombre de Bella Vista tiene su origen en un paso de ganado que existía sobre el Río Apa, que por su gran belleza natural llamaba la atención, cabe mencionar que también se le llama Bella Vista Norte, como una forma de diferenciarla de la otra Bella Vista que se encuentra ubicada en el sur del país⁴⁶.

3.2. Datos de Población

Según datos de la Dirección General de Estadística, Encuestas y Censo (DGEEC), la población total del Departamento de Amambay es de 172.169, perteneciendo al Distrito de Bella Vista 17.765 habitantes. Esta totalidad representa al 10,32% de la población del departamento. Bella Vista está

⁴³ Disponible en: <https://www.bienvenidoaparaguay.com/showdata.php?xmlcity=208&xmldestino=297>

⁴⁴ Ídem

⁴⁵ Municipalidad de Bella Vista. (2016) Plan de Desarrollo Municipal. Período 2016-2021.

⁴⁶ Ídem

conformado por 8.982 hombres y 8.783 mujeres (Proyección 2020). Como puede observarse en la siguiente tabla, en su mayoría, es decir, el 50,56% de la población del distrito está conformada por hombres y el 49,44% por mujeres.

Tabla 26. Población total de Bella Vista por sexo. Año 2020

Bella Vista	Población	Porcentajes
Hombres	8.982	50,56%
Mujeres	8.783	49,44%
Total (ambos sexos)	17.765	100
% Población Total del Distrito según total del Departamento.	172.169	10,32

Fuente: *Elaboración propia en base a datos de la DGEEC. Dpto. Amambay. Población estimada y proyectada, según distrito, sexo y grupos de edad, 2000-2025*

Asimismo, en la siguiente tabla se presentan las cifras sobre población estimada y proyectada del Distrito de Bella Vista, la diferencia en la relación cantidad hombres /mujeres (mayoría hombres) se ha mantenido en los últimos 5 años.

Tabla 27. Evolución de la población de Bella Vista en los últimos 5 años (2016-2020)

Distrito Bella Vista	2016	2017	2018	2019	2020
Hombres	8.077	8.300	8.525	8.752	8.982
Mujeres	7.895	8.113	8.334	8.557	8.783
Población total	15.972	16.413	16.859	17.309	17.765

Fuente: *DGEEC. Dpto. Amambay. Población estimada y proyectada, según distrito, sexo y grupos de edad, 2000-2025*

Así mismo, la DGEEC, presenta datos sobre la proyección de la población de Bella Vista en los siguientes 5 años, desde el 2020 al 2025, en la tabla 28 se observa que la cantidad de habitantes aumenta paulatinamente.

Tabla 28. Tabla 2. Proyección de la población en los siguientes 5 años (2020-2025)

Departamento y distrito	Año					
	2020	2021	2022	2023	2024	2025
Dpto. Amambay	172.169	174.721	177.252	179.773	182.281	184.772
Bella Vista Norte	17.765	18.226	18.690	19.160	19.634	20.111

Fuente: *DGEEC. Dpto. Amambay. Población estimada y proyectada, según distrito, sexo y grupos de edad, 2000-2025*

En el Plan de Desarrollo Municipal se presenta la división territorial del Distrito de Bella Vista, afirmando que se encuentra dividido en:

- 8 barrios (Inmaculada Concepción, San Antonio, Aviación, Yvy Pyta, María Auxiliadora, Perpetuo Socorro, en Obrero y Apa) y,
- 11 colonias como Sargento Dure, San Isidro, Santa Ana del Apa, Nueva Esperanza, Rinconada, Mandyju Poty, Casualidad, Ayala Cue, Colonias Unidas, San Roque y Agropastoril San Pedro, con sus respectivas particularidades diarias que forman parte del entorno social cotidiano e histórico la comunidad⁴⁷.

⁴⁷Municipalidad de Bella Vista. (2016) Plan de Desarrollo Municipal. Período 2016-2021.

Población Indígena

Con respecto a la población indígena, según datos de la DGEEC: del III Censo Nacional de Población y Viviendas para pueblos Indígenas por Departamento 2012, en el distrito de Bella Vista, existen 9 comunidades indígenas, conformadas por 1818 habitantes, de los cuales, 949 son hombres y 869 son mujeres, correspondientes a 3 pueblos indígenas (Paĩ Tavyterã, Maká y Ava Guaraní) ⁴⁸, distribuidos en 442 viviendas particulares y colectivas, todas asentadas en el área rural del distrito.

Tabla 29. Distribución de la Población Indígena de Bella Vista. Año 2012

Distrito	Comunidad, aldea o barrio y núcleo familiar	Pueblo	Cantidad de viviendas particulares y colectivas	Población		
				Total	Varones	Mujeres
Bella Vista	Apyka Jegua	Paĩ Tavyterã	18	65	35	30
Bella Vista	Cerro Akãngue	Paĩ Tavyterã / Maká	88	421	224	197
Bella Vista	Ita Jeguaka	Paĩ Tavyterã / Ava Guaraní	126	574	296	278
Bella Vista	Apyka Rendy'i	Paĩ Tavyterã	6	32	20	12
Bella Vista	Yvyty Rovi Cerro Amambay	Paĩ Tavyterã	46	167	85	82
Bella Vista	Guyra Ñe'ëngatu Amba	Paĩ Tavyterã	25	123	66	57
Bella Vista	Satĩ	Paĩ Tavyterã	32	109	51	58
Bella Vista	Arroyo Ka'a	Paĩ Tavyterã	46	176	92	84
Bella Vista	Yvy Oka	Paĩ Tavyterã	35	151	80	71
Total	9	3	422	1818	949	869

Fuente: DGEEC: III Censo Nacional de Población y Viviendas para pueblos Indígenas por Departamento 2012

Se especifica que, de la totalidad de la población del distrito de Bella Vista, el 10,23% corresponde a las comunidades indígenas, conformadas en su mayoría por hombres con el 52,20% y en menor proporción por mujeres con el 47,80%, como se puede observar en la siguiente tabla.

Tabla 30. Población indígena de Bella Vista, por sexo. Año 2012

Distrito de Bella Vista	Población Indígena	Porcentajes
Hombres	949	52,20
Mujeres	869	47,80
Total (ambos sexos)	1818	100
% Población del Distrito	17.765	10,23
% Población Total del Departamento	172.169	1,06

Hogares, vivienda

En relación a este tema, según datos extraídos de la DGEEC-Censo 2012, el 75,51% de la población total del distrito de Bella Vista cuenta con vivienda propia.⁴⁹

⁴⁸ DGEEC. Población indígena por sexo y cantidad de viviendas particulares y colectivas según área, distrito, comunidad, aldea o barrio y núcleo de familia y pueblo, 2012. Disponible en: <https://www.dgeec.gov.py/default.php?publicacion=33>

⁴⁹ DGEEC. Censo 2012 disponible en <https://www.dgeec.gov.py/vt/Indicadores-distritales.php>

Necesidades Básicas Insatisfechas (NBI)

Teniendo en cuenta los datos de la DGEEC sobre Necesidades Básicas Insatisfechas (NBI)⁵⁰ en el distrito de Bella Vista, indican que el 64% de los hogares de este distrito cuentan con al menos una NBI; el 46,5% de hogares con NBI en infraestructura sanitaria; el 32,2% de los Hogares con NBI en acceso a la educación; el 23,5% de los hogares con NBI en calidad de la vivienda y el 16,2% de los Hogares con NBI en capacidad de subsistencia. Los datos se señalan en la siguiente tabla.

Tabla 31. Hogares con NBI, según departamento y distrito (a partir de acá se modifica el nro de tablas)

Indicadores de Necesidades Básicas Insatisfechas (NBI) (%)	Total País	Departamento de Amambay	Distrito de Bella Vista
Hogares particulares ocupados con personas presentes	1.232.496	27.047	2.675
% Hogares con al menos una NBI	43,0	48,3	64,0
% Hogares con NBI en calidad de la vivienda	12,6	18,6	23,5
% Hogares con NBI en infraestructura sanitaria	20,8	26,5	46,5
% Hogares con NBI en acceso a la educación	15,7	25,9	32,2
% Hogares con NBI en capacidad de subsistencia	14,9	14,7	16,2

Fuente: DGEEC. *Triptico Necesidades Básicas Insatisfechas (NBI) 2012. Paraguay en base a STP-DGEEC. Censo Nacional de Población y Viviendas 2012.*

3.3. Economía

Actividades económicas

Según información de la Municipalidad de Bella Vista, la economía del distrito se basa predominantemente en producción agrícola y ganadera; se destaca además el comercio fronterizo por encontrarse frente a la ciudad brasileña del mismo nombre (Bela Vista). Es importante mencionar aquí la gran oportunidad con la que cuentan de explotar turísticamente la zona gracias a sus atractivos naturales.

Asimismo, en Bella Vista se encuentran asentados pobladores pertenecientes a Pueblos Originarios, cuyas actividades económicas se centran en la caza, pesca, recolección de alimentos y también en menor medida la venta de artesanías⁵¹.

3.4. Acceso a servicios

Acceso a servicios básicos

Según datos extraídos del Plan de Desarrollo Municipal los pobladores del distrito de Bella Vista acceden a servicios básicos como; sistema de eliminación de basura; desechos cloacales (pozos ciegos absorbentes), el acceso a agua corriente en zona rural lo hacen por medio de juntas de saneamiento y en la zona urbana a través de la ESSAP.

50 DGEEC. Necesidades Básicas Insatisfechas (NBI) 2012 PARAGUAY. Disponible en: <https://www.dgeec.gov.py/Publicaciones/Biblioteca/investigacion%20tematica/Triptico-de-necesidades-insatisfechas-NBI-2012.pdf>

⁵¹ Municipalidad de Bella Vista. (2016) Plan de Desarrollo Municipal. Período 2016-2021.

En esta línea, según indicadores distritales del censo 2012 de la DEGEEC, en el distrito de Bella Vista, el 78,62 % de la población tiene acceso a luz eléctrica; el 61,76% de la población tiene acceso a agua corriente; el 20,34% accede a la disposición de residuos sólidos.

Según el Plan de Desarrollo Municipal, los servicios sociales disponibles en Bella Vista Norte son:

- Asistencia a la primera infancia a través de la guardería de ALMA GUARANI, reforma, ampliación, equipamiento, funcionamiento y mantención de la misma mediante las gestiones paralelas de la municipalidad y los padres de los beneficiarios de dicho servicio.
- Servicio de asistencia a personas de escasos recursos mediante la provisión de medicamentos, estudios médicos, y traslado de enfermo.
- Apoyo constante a instituciones educativas.
- Apoyo Universitario con beca y gestiones para usufructo de beca universitario con ITAIPU, Secretaria Nacional de la Juventud y Consejo Nacional de Becas.
- Campaña de recolección y distribución de abrigos en épocas de frío.
- Acompañamiento y ayuda a las familias afectadas por las inundaciones.
- Apoyo económico a las Instituciones Educativas más necesitadas.
- Transporte escolar para los alumnos de las Escuelas de Santa Ana y San Isidro.
- Apoyo mediante el programa de gobierno de la Secretaría de la Acción Social, específicamente con Tekoporã.

Educación

En relación al acceso a la educación, según datos del Ministerio de Educación y Ciencias (MEC), en el Distrito de Bella Vista se encuentran 30 instituciones educativas, de las cuales 8 están ubicadas en el área urbana y 22 en el área rural. De la totalidad, de instituciones, 13 tienen Modalidad de Educación Inicial (4 en el área urbana y 9 en el área rural); 27 instituciones con Modalidad de Educación Escolar Básica (5 en el área urbana y 22 en el área rural); 3 instituciones con Modalidad de Educación Media (2 en el área urbana y 1 en el área rural); 2 instituciones con Modalidad de Educación Permanente, ambas en el área urbana. Los datos se señalan en la siguiente tabla.

Tabla 32. Nivel educativo según zona de ubicación

Nivel educativo	Zona		
	Total	Urbana	Rural
Distrito Horqueta			
Educación inicial	13	4	9
Escolar Básica	27	5	22
Educación media	3	2	1
Educación Permanente	2	2	-
Total	45	13	32

Fuente: elaboración en base a los datos del MEC- Datos abiertos, Establecimientos escolares 2019 y la Guía Completa de Educación en Paraguay.

A continuación, se presenta cada institución educativa y sus características:

Tabla 33. Instituciones educativas del Distrito de Bella Vista por zona, modalidad, acceso a agua y energía

Instituciones Educativas Distrito de Bella Vista	Localidad/B arrio	Zona	Asentamiento	Comunidad Indígena	Modalidad	Agua	Energía
En 1 Establecimiento: Centro N° 13 -18 y 49 y Escuela Bás. N° 188 Bella Vista	Obrero	Urbana	-	-	EI, EEB y EP	ESSAP	ANDE
Colegio Nac. Ntra. Sra. del Perpetuo Socorro.	Obrero	Urbana	-	-	EEB y EM	ESSAP	ANDE
Escuela Bás. N° 1145 Parroq. Priv. Subv. San José.	Inmaculada	Urbana	-	-	EI, EEB y EM	-	-
Escuela Bás. N° 1957 Gral. Marcial Samaniego.	San Antonio	Urbana	-	-	EI, EEB y EP	ESSAP	ANDE
Escuela Bás. N° 6828 Ma. Auxiliadora.	Inmaculada	Urbana	-	-	EI y EEB	ESSAP	ANDE
Escuela Bás. N° 2324 Ma. Auxiliadora.	-	Rural	Ruta III Altura 180		EEB	No	No
Escuela Bás. N° 14275 Tranquerita.	-	Rural	Las Mercedes	-	EEB	Pozo común	No
Escuela Bás. N° 1958 San Roque.	San Roque	Rural	-	-	EEB	-	-
Escuela Bás. N° 2008 Mandyju Poty.	-	Rural	-	-	EEB	Pozo artesiano	ANDE
Escuela Bás. N° 2323 Excombatientes del Chaco.	-	Rural	Casualidad	-	EEB	Pozo común	ANDE
Escuela Bás. N° 2324 Ma. Auxiliadora	-	Rural	Ruta III Altura 180	-	EEB	Pozo artesiano	No
Escuela Bás. N° 3990 Santa Teresa.	-	Rural	Estancia Santa Teresa	-	EI y EEB	Pozo artesiano	ANDE
Escuela Bás. N° 3994 Juan Carlos Wasmosy.	-	Rural	-	-	EEB	Pozo común	ANDE
Escuela Bás. N° 4668 San Isidro.	-	Rural	San Isidro	-	EI y EEB	Pozo artesiano	ANDE
Escuela Bás. N° 4773 Rinconada.	-	Rural	Rinconada	-	EEB	Pozo artesiano	ANDE
Escuela Bás. N° 6507 Cerro Akangue	-	Rural	-	Cerro Akangue	EI-EEB	Pozo común	Panel Solar
Escuela Bás. N° 6508 Itajeguaka	-	Rural	-	Itajeguaka	EI EEB EM	Pozo común	Panel Solar
Escuela Bás. N° 7102 Colonias Unidas.	-	Rural	Colonia Unidas	-	EI EEB	SENAS A	ANDE

Instituciones Educativas Distrito de Bella Vista	Localidad/B arrio	Zona	Asentamiento	Comunidad Indígena	Modalidad	Agua	Energía
Escuela Bás. N° 7103 San Luis	-	Rural	Rinconada	-	EEB	Pozo artesiano	ANDE
Escuela Bás. N° 7665 Arroyo Ka'a	-	Rural	-	Arroyo Ka'a	El y EEB	pozo común	No
Escuela Bás. N° 7668 Kuña Poty`i	-	Rural	-	Kuña Poty`i	El y EEB	Pozo común	ANDE
Escuela Bás. N° 8028 Santa Ana del Apa.	-	Rural	Santa Ana	-	EEB	Pozo artesiano	ANDE
Escuela Bás. N° 8094 Nueva Esperanza.	-	Rural	Nueva Esperanza	-	EEB	Pozo artesiano	ANDE
Escuela Bás. S/N° La Cascada.	-	Rural	-	-	EEB	Privado	ANDE
Escuela Básica N° 15149. Sanguina Cue	Sanguina Cue - San Juan	Rural	-	-	El y EEB	-	-
Liceo Nacional Santa Teresa	Santa Teresa	Rural	-	-	EEB	-	-
Escuela Bás. N° 7853 S/N		Rural	-	-	El y EEB	Pozo común	No

Fuente: elaboración en base a los datos del MEC- Datos abiertos, Establecimientos escolares 2019 y la Guía Completa de Educación en Paraguay.

Salud

Según datos del Ministerios de Salud Pública y Bienestar Social, los pobladores del Distrito de Bella Vista cuentan con 1 Hospital Regional; 3 Unidades de Salud Familiar (USF Urbano Bella Vista, USF San Isidro y USF San Roque) y 1 Centro de Salud (CS San Isidro)⁵².

⁵² MSPyBS. Disponible en <https://www.mspbs.gov.py/donde-consulto.php>

4. Distrito de Paso Barreto

4.1. Características generales

El 31 de mayo del año 2013 la Ciudad de Paso Barreto fue distritada por Ley N° 4.926, ubicada a 56 km de distancia de la capital de Concepción, unido por un camino de tierra enripiada. El distrito tiene una extensión de 215.824 hectáreas⁵³. La distancia de Paso Barreto a la capital del País es de 445 km por Ruta Horqueta.

Limita al Norte con Sargento José Félix López, al Este con Yby Yau, al Sur con Horqueta y Loreto, al Sur Oeste con Concepción y al Oeste con San Alfredo.

Desde lo señalado por referentes del municipio⁵⁴, se desconoce la fecha exacta de la fundación de la Ciudad de Paso Barreto, aunque aseguran tiene origen fundacional muy antiguo, mediados de 1.800 (aproximadamente) según los primeros pobladores. Se sabe que el nombre guarda relación con un hombre de apellido Barreto que radicaba en la zona desempeñándose como pasero en balsa por el Río Aquidabán, éste era reconocido por su carácter amable y hospitalario.



Fuente: Registro fotográfico de trabajo de campo. Equipo consultor. Concepción. Agosto -Septiembre 2020.

Así mismo, en el Plan Local de Salud de Paso Barreto se señala que la población era muy reducida en aquel entonces, aproximadamente 15 viviendas. Las primeras familias que poblaron fueron de apellidos De León, Ferreira y Blanco. En el año 1870, el 9 o 10 de febrero, pasó por el lugar el ejército para captura y muerte del Mariscal Francisco Solano López en Cerro Cora, y el 3 o 4 de marzo del mismo año estuvo como prisionera de guerra Alicia Elisa Lynch, la esposa del Mariscal López.

En la consulta realizada en campo, los pobladores del distrito (Localidad de Paso Barreto, Isla Hermosa, Estribo del Plata y Jorge Sebastián Miranda), han manifestado que se destacan “la buena convivencia”, que son “comunidades muy tranquilas”, que hay “unidad entre los pobladores”, con “personas con ganas de trabajar y sobresalir”, con “mucha naturaleza y bajo nivel de contaminación”.

También, han comentado que las actividades festivas importantes para la zona están relacionadas al ámbito religioso y fundacional (distritación), durante los meses de junio, agosto, septiembre y diciembre.

Asimismo, se realizan actividades como karu guazú (comida compartida/comunitaria), bingos y torneos de inter-barrio; actividades deportivas, lacedadas, pesca y visitas al Río Aquidabán; igualmente, actividades por el día del niño y de la juventud, con campeonatos intercolegiales, festivales, entre otros.

⁵³MSPBS-CIRD. (2015) Plan Local de Salud de Paso Barreto. Período 2015-2018. Disponible en: https://www.cird.org.py/institucional/documentos/Plan_Local_Salud_Paso_Barreto.pdf

⁵⁴ Municipalidad de Paso Barreto. Disponible en: <https://www.municipalidadpasobarreto.gov.py/>

En las Actividades de las USF destacan caminatas con adultos mayores, diabéticos e hipertensos donde también acompañan los niños, charlas y juegos, actividades con el club de madres y embarazadas, entre otras.

4.2. Datos de Población

Según datos de la Dirección General de Estadística, Encuestas y Censo (DGEEC)⁵⁵, la proyección de la población del Departamento de Concepción es de 254.976, perteneciendo al Distrito de Paso Barreto 4.185 habitantes. Esta totalidad representa 1,64% de la población del departamento. Paso Barreto está conformado por 1.944 hombres y 2.241 mujeres (Proyección 2020). Como se puede observar en la siguiente tabla en su mayoría, es decir, el 53,55% de la población del distrito está conformada por mujeres y el 46,45% por hombres.

Tabla 34. Población estimada y proyectada de Paso Barreto, por sexo. Año 2020

Paso Barreto	Población	Porcentajes
Hombres	1.944	46,45
Mujeres	2.241	53,55
Total (ambos sexos)	4.185	100
% Población Total del Departamento	254.976	1,64

Fuente: Elaboración propia en base a datos de la DGEEC. Dpto. Concepción. Población estimada y proyectada, según distrito, sexo y grupos de edad, 2000-2025

Con respecto a los datos de proyección de la DGEEC⁵⁶ para el Distrito de Paso Barreto, se puede observar en la siguiente tabla, que la población total en los últimos 5 años ha aumentado lentamente, considerando que la cantidad de hombres disminuye y la de mujeres aumenta.

Tabla 35. Evolución de la población en los últimos 5 años (2016-2020)

Distrito Paso Barreto	2016	2017	2018	2019	2020
Hombres	1.990	1.979	1.967	1.956	1.944
Mujeres	2.146	2.169	2.193	2.217	2.241
Población total	4.136	4.148	4.161	4.173	4.185

Fuente: DGEEC. Dpto. Concepción. Población estimada y proyectada, según distrito, sexo y grupos de edad, 2000-2025.

Según esta misma fuente, los datos proyectados para los siguientes 5 años a partir del 2020 muestran una pequeña disminución de la población en el distrito de Paso Barreto, como se puede ver en la siguiente tabla.

Tabla 36. Proyección de la población en los siguientes 6 años (2020-2025)

Departamento y distrito	Año					
	2020	2021	2022	2023	2024	2025
Dpto. Concepción	254.976	258.653	262.360	266.072	269.805	273.579
Paso Barreto	3.885	3.858	3.831	3.803	3.775	3.747

Fuente: STP/DGEEC. Paraguay. Proyección de la población por sexo y edad, según distrito, 2000-2025. Revisión 2015.

⁵⁵Paraguay. Proyección de la población por sexo y edad, según distrito, 2000-2025. Revisión 2015. Disponible en: <https://www.dgeec.gov.py/vt/default.php?publicacion=2>

⁵⁶Ídem.

Seguidamente se presentan los datos oficiales del municipio⁵⁷ que, como puede observarse en la siguiente tabla, muestran variaciones en las cifras de población, siendo la totalidad 4.830 habitantes.

Tabla 37. Población total del distrito Paso Barreto Año 2020

Distrito Paso Barreto	Población
Paso Barreto	2.600
Colonia Jorge S. Miranda	1.250
Isla Tuyú	550
Jaguareté Potrero	40
Estribo de Plata	50
Colonias Indígenas (Boquerón y Jeguahaty)	340
Población Total del Distrito	4.830

Fuente: Elaboración propia con datos de población de la Municipalidad de Paso Barreto 2020.

Según el Consejo de Salud de Paso Barreto, el territorio se encuentra dividido en 6 barrios (San Salvador, María Auxiliadora, Inmaculada Concepción, 6 de Agosto, Santo Domingo y Carbonería); la zona rural en 6 compañías (Isla Tuyu, Cañada, Jaguarete, Peguahó, Colonia Jorge S. Miranda y Estribo de Plata) y 3 comunidades Indígenas (asentadas en terrenos ubicados hacia Hugua Ñandu y Puentesño)⁵⁸.

Tabla 38. Distribución de la población de Paso Barreto

P O B L A C I Ó N	Paso Barreto		
	Barrios	Compañías	Población indígena
	San Salvador	Isla Tuyu	Jeguahaty
	María Auxiliadora	Cañada	Vy'arenda
	Inmaculada Concepción	Jaguarete	Takuarendihu
	6 de Agosto	Peguahó	-
	Santo Domingo	Colonia Jorge S. Miranda (Jhugua Ñandu)	-
	Carbonería	Estribo de Plata	-
Total	6	6	3

Fuente: Elaboración propia con datos del Plan Local de Salud de Paso Barreto 2015/2018.

Hogares, vivienda

En relación a la condición de propiedad de la vivienda, según datos entregados por la DGEEC⁵⁹, en el Distrito de Paso Barreto, existen 838 viviendas particulares ocupadas pre censadas, el mayor porcentaje corresponde a “viviendas propias” y en menor proporción a otras condiciones de propiedad como “prestada o cuidan”, “alquilada”, “lo están pagando a cuotas” y por último “ocupada de hecho”. Los datos en porcentaje se detallan en la tabla siguiente.

⁵⁷ Municipalidad de Paso Barreto. Disponible en: <https://www.municipalidadpasobarreto.gov.py/>

⁵⁸ MSPBS-CIRD. (2015) Plan Local de Salud de Paso Barreto. Período 2015-2018. Disponible en: https://www.cird.org.py/institucional/documentos/Plan_Local_Salud_Paso_Barreto.pdf

⁵⁹ Datos solicitados y proveídos por la DGEEC. Sep. 2020.

Tabla 39. Condición de propiedad de la vivienda

Condición de propiedad de la vivienda	Departamento de Concepción	Distrito Barreto	Paso
Viviendas particulares ocupadas con personas presentes	42.402		838
% Es propia	85,2		87,6
% La están pagando en cuotas	0,9		0,5
% Es en condominio	0,4		-
% Es alquilada	5,1		1,3
% Es prestada, la cuidan	7,5		9,9
% Es ocupada de hecho	0,8		0,2
% No informado	0,1		0,5

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012.

Necesidades Básicas Insatisfechas (NBI)

En el Distrito de Paso Barreto, según datos publicados de la DGEEC sobre Necesidades Básicas Insatisfechas (NBI)⁶⁰ y los datos proveídos por la DGEEC⁶¹ en el marco del presente estudio, sobre Medición de las NBI a partir del Censo Nacional de Población y Viviendas 2012, indican que el 65,1% de los hogares del distrito registra al menos una NBI; el 31,1% de los hogares con NBI en acceso a la educación; el 28,8% de los hogares con NBI en infraestructura sanitaria; el 24,2% de los hogares con NBI en capacidad de subsistencia; por último así como puede observarse en la siguiente tabla, el 22,3% de los hogares con NBI en calidad de la vivienda.

Tabla 40. Hogares con NBI, según departamento y distrito

Indicadores de Necesidades Básicas Insatisfechas (NBI) (%)	Total hogares	Departamento de Concepción	Distrito de Paso Barreto
Hogares particulares ocupados con personas presentes	1.232.496	42.638	839
% Hogares con al menos una NBI	43,0	56,2	65,1
% Hogares con NBI en calidad de la vivienda	12,6	19,0	22,3
% Hogares con NBI en infraestructura sanitaria	20,8	29,7	28,8
% Hogares con NBI en acceso a la educación	15,7	20,3	31,1
% Hogares con NBI en capacidad de subsistencia	14,9	19,8	24,2

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012 y Tríptico Necesidades Básicas Insatisfechas (NBI) 2012. Paraguay en base a STP-DGEEC. Censo Nacional de Población y Viviendas 2012.

4.3. Economía

Con respecto a los datos publicados por la Municipalidad del distrito de Paso Barreto, las actividades económicas que predominan en el mismo son, primeramente, la ganadería; seguido, de la agricultura y horticultura, aserraderos y estancias; luego se observan instituciones públicas y privadas, locales de servicios, jornaleros y peones; por último, en muy baja proporción se observan actividades comerciales en zona urbana y artesanía. (Esta información se da teniendo en cuenta el sector económico y la tabla de actividades económicas)

⁶⁰ DGEEC. Necesidades Básicas Insatisfechas (NBI) 2012 PARAGUAY. Disponible en: <https://www.dgeec.gov.py/Publicaciones/Biblioteca/investigacion%20tematica/Triptico-de-necesidades-insatisfechas-NBI-2012.pdf>

⁶¹ Datos solicitados y proveídos por la DGEEC, Sep. 2020.



Aserradero - Paso Barrero



Municipalidad de Paso Barreto

Fuente: Registro fotográfico de trabajo de campo. Equipo consultor. Concepción. Agosto - septiembre 2020

Actividades económicas

En el Distrito de Paso Barreto predominan las actividades relacionadas el sector primario con el 57,6%, seguido del sector terciario con 23,9% y finalmente con menor porcentaje, el sector secundario con el 17,0%. En la siguiente tabla se señalan los datos por sector económico de la población, tanto a nivel distrital como departamental.

Tabla 41. Población ocupada por sector económico

Datos de Población	Departamento de Concepción	de Distrito de Paso Barreto
Sector económico de la población ocupada	226.585	4.085
% Primario	40,9	57,6
% Secundario	15,7	17,0
% Terciario	42,2	23,9
% No informado	1,2	1,5

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012.

Con respecto a las actividades económicas, los pobladores de las localidades de Paso Barreto, Isla Hermosa, Estribo del Plata y J.S. Miranda, han mencionado que las principales son la agricultura y pequeña ganadería con producción de leche y derivados, en su mayoría para auto consumo y la ganadería a gran escala por las estancias de la zona. Faena de vaca, gallina y ganado menor. Producción y venta de sombreros de karanday. También, pesca con fines comerciales y consumo, aserraderos, carbonerías y frigoríficos.

Asimismo, mencionaron que los pobladores migran por trabajo, los hombres desde temprana edad (a partir de los 12 años, algunos ya no continúan sus estudios), van al Chaco para trabajar en las estancias como jornaleros mediante contratistas; las mujeres, algunas trabajan en las estancias con sus esposos y otras migran a Pedro Juan Caballero, Asunción, Argentina y España.

Otro aspecto señalado radica en que las mujeres, en su mayoría se dedican a tareas del hogar, otras mujeres al comercio, decoración, alquileres, gastronomía en general, peluquería, corte y confección (se cuenta con capacitaciones del SNPP), y en algunos casos, funcionarias del Estado, así como algunos pobladores son funcionarios públicos y otros comerciantes.

4.4. Acceso a servicios

Acceso a Servicios básicos

En relación al acceso a servicios básicos en el distrito de Paso Barreto, se tienen datos proveídos por la DGEEC⁶². En la siguiente tabla se observa que en cuanto a energía eléctrica el 85,2% de las viviendas cuentan con este servicio; el 70,3% de las viviendas tienen acceso a agua corriente; el 22,1% de viviendas con saneamientos mejorados; en menor proporción el 0,1% de las viviendas cuentan con servicio de recolección de basura.

Tabla 42. Viviendas con acceso a servicios básicos

Datos de viviendas particulares Servicios básicos	Departamento de Concepción	Distrito de Paso Barreto
Viviendas particulares ocupadas con personas presentes	42.402	838
% Viviendas con energía eléctrica	93,1	85,2
% Viviendas con agua corriente ⁶³	74,4	70,3
% Viviendas con desagüe cloacal ⁶⁴	6,3	-
% Viviendas con recolección de basura	22,8	0,1
% Viviendas con saneamiento mejorado	46,9	22,1

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012.

Así mismo, según los datos del Plan Local de Salud⁶⁵ en el mismo distrito, se observa que en la zona urbana cuentan con servicio de agua corriente y energía eléctrica. Sin embargo, las comunidades indígenas no acceden a estos servicios, se proveen de agua de arroyos, tajamares, aljibes y pozos.

En cuanto al manejo de residuos sólidos, los datos del Plan Local de Salud de Paso Barreto muestran que la Municipalidad no posee vertedero para la disposición y el tratamiento de estos y la práctica más usual es la quema⁶⁶. En relación al saneamiento básico, la mayoría de la población utiliza letrinas comunes, en menor proporción existen hogares que cuentan con baños modernos⁶⁷.

Pobladores de las localidades que han participado en la consulta para el presente estudio, de Paso Barreto, Isla Hermosa y J.S. Miranda, han mencionado que cuentan con red de agua potable a través de las juntas de saneamiento, algunos por vía de la gobernación, pero el mantenimiento es a través de las comisiones, a excepción de Estribo de Plata que no cuenta con comisión de agua y en su mayoría utilizan pozos.

Las comunidades indígenas de la zona cuentan con tanques, una tiene sistema de agua, otra no porque no tienen energía eléctrica, pero sacan del Río Aquidaban, pozo o de arroyos cercanos.

⁶² Datos solicitados y proveídos por la DEGEEC. Sep. 2020.

⁶³ Incluye: ESSAP, SENASA, red comunitaria, red privada, y pozo artesiano, con cañería fuera de la vivienda pero dentro del terreno o con cañería hasta la cocina y/o baño.

⁶⁴ Incluye: Desagüe por red pública, pozo ciego con y sin cámara séptica.

⁶⁵ MSPBS-CIRD. (2015) Plan Local de Salud de Paso Barreto. Período 2015-2018. Disponible en: https://www.cird.org.py/institucional/documentos/Plan_Local_Salud_Paso_Barreto.pdf

⁶⁶ Ídem

⁶⁷ Ídem

En relación al acceso a desagüe pluvial, la única localidad que cuenta con este servicio es Paso Barreto y actualmente se encuentran trabajando en un proyecto de alcantarillado sanitario en la ciudad.

Con respecto al uso de Pozo séptico/Letrina/Otro, han mencionado que en Paso Barreto el 40% tiene letrina, debido a la vulnerabilidad y escasos recursos, en la zona urbana se utiliza pozo ciego y cámara séptica. En Isla Hermosa sólo el 2% cuenta con baño moderno, la mayoría dispone de letrina. En Estribo de Plata sólo en 5 viviendas se cuenta con pozo ciego, en su mayoría letrina y en J. S. Miranda la mayoría tiene baño común, menos del 45% tiene baño moderno (beneficiarios del proyecto de vivienda).

También, han mencionado que en el Distrito no cuentan con planta de tratamiento de basura ni con servicio de recolección, aún acuden a la quema o entierro; en la Ciudad de Paso Barreto se quema semanalmente en un sitio específico (en la Municipalidad).



Sistema de Agua Paso Barreto
Fuente: Registro fotográfico de trabajo de campo.
Equipo consultor. Concepción. Agosto -Septiembre 2020.

Así mismo, en las localidades consultadas se confirmó que existen viviendas que no cuentan con conexión de ANDE, como el caso de J.S. Miranda y Estribo de Plata. También mencionaron que tienen cortes muy seguido y que las instalaciones son muy precarias.



Horno para incineración de basura - Fuente:
Registro fotográfico de trabajo de campo. Equipo
Consultor. Concepción. Agosto -septiembre 2020.

Educación

Con respecto al acceso a la educación en el distrito de Paso Barreto, se cuenta con datos del Plan Local de Salud, los cuales reflejan que la mayoría de los niños y niñas accede a la educación escolar básica y un porcentaje muy bajo no acude a centros educativos, existe un gran porcentaje de jóvenes que estudia y practica deportes y al finalizar la educación media migran para estudios universitarios debido a que en el distrito no existe universidades⁶⁸.

⁶⁸ Ídem

Así mismo, datos del Ministerio de Educación y Ciencias (MEC)⁶⁹ revelan que en el Distrito de Paso Barreto, se encuentran 10 instituciones educativas en total, 3 ubicadas en el área urbana y 7 en el área rural, de las cuales 4 están situadas en asentamientos y 2 en comunidades indígenas. Se especifica, además, que, de esta totalidad de instituciones, 7 cuentan con Modalidad Inicial y Educación Escolar Básica (2 en área urbana y 5 en rural), en cuanto a la modalidad Educación Media, existen 2 instituciones (1 en área urbana y 1 en área rural). Los detalles se señalan en la tabla siguiente.

Tabla 43. Nivel educativo en el distrito por zona

Nivel de enseñanza	Total	Zona	
		Urbana	Rural
Educación inicial	7	2	5
Escolar Básica	7	2	5
Educación media	2	1	1
Total	16	5	11

Fuente: Elaboración en base a datos actualizados del MEC - Datos abiertos, Establecimientos escolares 2019



Colegio Gral. Marcial Samaniego



Escuela Isabel Paredes Chávez



Escuela María Auxiliadora

Fuente: Registro fotográfico de trabajo de campo. Equipo consultor. Concepción. Agosto -Septiembre 2020

Es importante aclarar que existen establecimientos que tienen más de una institución y que en las instituciones podría impartirse más de una modalidad.

A continuación, se presenta cada institución educativa y sus características:

Tabla 44. Instituciones educativas por zona, modalidad, acceso a agua y energía

Instituciones	Distrito de Paso Barreto						
	Localidad	Zona	Asentamiento	Comunidad Indígena	Modalidad	Agua	Energía
Escuela Básica N° 445 Isabel Paredes Chávez	Paso Barreto	Urbana	-	-	E.I. E.E.B.	SENASA	ANDE
Escuela Básica N° 15251 Inmaculada Concepción	Paso Barreto	Urbana	-	-	E.I. E.E.B.	SENASA	ANDE

⁶⁹ Disponible en: https://datos.mec.gov.py/data/establecimientos_escolares_priorizados_elegibles_fonacide

Instituciones	Distrito de Paso Barreto						
	Localidad	Zona	Asentamiento	Comunidad Indígena	Modalidad	Agua	Energía
Colegio Nacional Gral. Marcial Samaniego	Paso Barreto	Urbana	-	-	E.M.	SENASA	ANDE
Escuela Básica N° 15308 Hermes Arámbulo	Isla Tuyu	Rural	-	-	E.I. E.E.B.	SENASA	ANDE
Escuela Básica N° 2076	Isla Tuyu	Rural	-	-	E.I. E.E.B. E.B.A.	SENASA	ANDE
Escuela Básica N° 1732 Dominga Ocariz de Samaniego	Col. Jorge Sebastián Miranda	Rural	-	-	E.I. E.E.B. E.M.	SENASA	ANDE
Escuela Básica N° 3229 San Juan Bautista	Col. Jorge Sebastián Miranda	Rural	Jhugua Ñandu	-	E.I. E.E.B.	SENASA	ANDE
Escuela Básica N° 14469 Virgen de las Mercedes	Col. Jorge Sebastián Miranda	Rural	Jhugua Ñandu	-	E.I. E.E.B.	SENASSA	ANDE
Escuela Básica N° 6291 Jeguahaty	Jeguahaty	Rural	Jeguahaty	Jeguahaty	E.E.B.	TAJAMAR	PANEL SOLAR
Escuela Bàsica N° 7577 Vy`a Renda	Vy`a Renda	Rural	Vy`a Renda	Vy`a Renda	E.E.B.	POZO ARTESIANO	ANDE

Fuente: elaboración en base a los datos del MEC- Datos abiertos, Establecimientos escolares 2019 y la Guía Completa de Educación en Paraguay.

Formación Profesional y Técnica

En lo que refiere al acceso a la formación profesional y técnica, dentro del Departamento de Concepción se observan varias ofertas de enseñanza en instituciones públicas y privadas. Según los datos extraídos de la página oficial de SINAFOCAL, en el distrito de Paso Barreto está planificado impartir cursos de Operación Básica de Computadoras.

Salud

En el Plan Local de Salud de Paso Barreto⁷⁰ se señala que las enfermedades más frecuentes en los adultos son la hipertensión y la diabetes; en los niños y las niñas se observan enfermedades como anemia, parasitosis, afecciones respiratorias y enfermedades bucodentales.

Las actividades del profesional de la salud consisten en realizar visitas domiciliarias, seguimiento a pacientes con enfermedades crónicas, detección temprana de embarazos en la comunidad, desarrollo de charlas educativas, vacunación y prestación de servicios en consultorios móviles. En Paso Barreto se cuenta con:

- 1 Unidad de Salud de la Familia en Paso Barreto
- 1 Unidad de Salud de la Familia en Jorge Sebastián Miranda
- 1 Puesto de Salud Isla Tuyu
- 1 Farmacia privada
- En la Municipalidad funciona un dispensario de medicamentos gratuito
- 2 Parteras empíricas: realizan partos en la comunidad
- 6 Médicos Naturalistas: realizan atenciones y recetan remedios caseros en base a hierbas.



USF Paso Barreto -Fuente: Registro fotográfico de trabajo de campo. Equipo consultor. Concepción. Agosto -Septiembre 2020

En cuanto a la disponibilidad de profesionales de la salud y otros, se cuenta con:

- 2 Médicos
- 2 Obstetras
- 3 Licenciadas en Enfermería
- 6 Auxiliares en Enfermería
- 1 Odontóloga
- 1 Chofer de Ambulancia
- 3 Personal de limpieza.

⁷⁰ MSPBS-CIRD. (2015) Plan Local de Salud de Paso Barreto. Período 2015-2018. Disponible en: https://www.cird.org.py/institucional/documentos/Plan_Local_Salud_Paso_Barreto.pdf

Acceso a Tecnologías de información y medios de comunicación (TIC) y bienes de confort

Según los datos proveídos por la DGEEC, en relación al acceso a TICs, puede identificarse que en la gran mayoría de las viviendas del Distrito de Paso Barreto cuentan con radio, teléfono celular y televisor; en menor porcentaje cuentan con antena parabólica, TV cable, computadoras, entre otros. Los datos se detallan en porcentajes en la siguiente tabla.

Tabla 45. Equipos domésticos y TIC

Acceso a TIC	Departamento de Concepción	Distrito de Paso Barreto
Viviendas particulares ocupadas con personas presentes	42.402	838
% Viviendas con radio	80,6	79,5
% Viviendas con televisor	79,8	70,8
% Viviendas con teléfono fijo	8,0	0,5
% Viviendas con teléfono celular	83,3	77,7
% Viviendas con computadora	11,9	2,0
% Viviendas con computadora conectada a internet	9,2	1,2
% Viviendas con antena parabólica	10,8	19,3
% Viviendas con TV cable	13,4	2,0

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012.

Los datos mencionados coinciden con la información brindada por los habitantes de las localidades consultadas (Paso Barreto, Isla Hermosa, Estribo de Plata y J. S. Miranda), quienes han indicado que los medios de comunicación más utilizados son: Radio, Televisión, Celulares y Redes Sociales.

Asimismo, se nombraron las siguientes emisoras radiales: Radio Regional AM de Concepción, la 89.9 de Horqueta, Radio Aquidabán y Santa Cecilia, Lira FM, Cristal FM 96.5 de Arroyito, Radio Loreto; canales de televisión: Canal 9 SNT, Telefuturo y canales por cable y Celulares con internet: a través de mensajería, llamadas y grupos de whatsapp (en algunas comunidades existe mala conexión a internet), y con la pandemia ha aumentado el uso para las tareas escolares.

Con relación a los bienes de confort en las viviendas, según datos entregados por la DGEEC, señalan que un alto porcentaje de las viviendas cuentan con motocicleta, heladeras y lavarropas, y en menor porcentaje con video/DVD, ducha eléctrica, aire acondicionado, horno microondas, automóvil/camioneta y termo-calefón.

Tabla 46. Equipos domésticos y Bienes de confort

Bienes de confort	Departamento de Concepción	Distrito de Paso Barreto
Viviendas particulares ocupadas con personas presentes	42.402	838
% Viviendas con heladera	68,1	61,8
% Viviendas con lavarropas	50,9	38,4
% Viviendas con video/DVD	21,2	8,9
% Viviendas con termocalefón	4,0	1,4

Bienes de confort	Departamento de Concepción	Distrito de Paso Barreto
% Viviendas con ducha eléctrica	25,7	7,2
% Viviendas con acondicionador de aire	15,2	4,4
% Viviendas con horno microondas	14,4	4,4
% Viviendas con automóvil/camioneta	9,9	3,9
% Viviendas con moto	74,3	80,7

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012.

5. Distrito de Loreto

5.1 Características generales

La Ciudad de Loreto se encuentra sobre una alta colina en el Departamento de Concepción, a una distancia de 20 km de la Ciudad Capital y a 440 km de Asunción. Limita con los distritos de Horqueta, Belén y Concepción. Se puede acceder a la ciudad por las rutas III Elizardo Aquino, V Bernardino Caballero y Coronel Franco-Chaco. Tiene una superficie de 996 km², organizada en 31 compañías rurales y 4 barrios urbanos⁷¹. Desde el año 1964 al año 1981 se crearon 11 colonias, correspondientes a 1969 lotes y 46.323 hectáreas⁷². El 80% vive en la zona rural.



Ciudad de Loreto. Fuente: Registro fotográfico de trabajo de campo. Equipo consultor. Concepción. Agosto -septiembre 2020

Según datos del Municipio, Loreto, conocida primeramente como “Paraje Jui’y, después “Capilla Zarza”, para posteriormente llamarse Loreto, en honor a “Nuestra Señora de Loreto”, fue fundada por Jesuitas, los cuales llegaron en 1686, pero tiene fecha de fundación el 10 de diciembre de 1792⁷³.

Desde lo expresado por los habitantes del distrito, de la ciudad de Loreto y localidades, se trata de un lugar con aspectos muy valorados por los mismos; “la tranquilidad, la armonía y la seguridad”, “conocerse entre pobladores”, “solidaridad” y “buena tierra para agricultura y ganadería”.

Asimismo, se comentó respecto de espacios de esparcimiento al aire libre y fiestas tradicionales en el distrito; fiestas patronales⁷⁴, la mayoría relacionadas al ámbito religioso, festivales, juegos tradicionales, laceda mecánica, torneos deportivos, carreras de caballo, bingo, jineteadas, entre otras. En la localidad de Jhugua Po’i, desde la USF se organizan actividades como charlas educativas con el club de embarazadas y el club de adultos mayores y en todas las escuelas se realizan festejos por el día del niño. En la localidad de Virgen del Camino mencionaron a la Asociación Cooperadora

⁷¹ Plan de Desarrollo Municipal de Loreto 2016. Disponible en: <http://www.municipalidadloreto.gov.py/wp-content/uploads/2014/11/plan-de-desarrollo-distrital-loreto2016.pdf>

⁷² Rojas, L. y Areco, A. (2017). Las Colonias Campesinas en el Paraguay.

⁷³ Datos de la Municipalidad de Loreto. Disponible en: <http://www.municipalidadloreto.gov.py/>

⁷⁴ En la ciudad de Loreto celebran esta fiesta en el mes de diciembre y en las demás comunidades consultadas en los meses de junio, octubre y noviembre.

Escolar (ACE) que organiza actividades para recaudar fondos ante necesidades de la institución y de la comunidad.

5.2. Datos de Población

Según datos de la DGEEC3, la población total del departamento de Concepción es de 254.976 habitantes, de los cuales pertenecen al distrito de Loreto 18.879, es decir, el 7,40% del total departamental.

El distrito de Loreto está conformado por 10.034 hombres y 8.846 mujeres (Proyección 2020)⁷⁵ como puede observarse en la siguiente tabla.

Tabla 47. Proyección de la población total por sexo, según distrito. Año 2020

Distrito de Loreto	Población	Porcentajes
Hombres	10.034	53,15
Mujeres	8.846	46,86
Total (ambos sexos)	18.879	100
% Población total del distrito por total departamental	254.976	7,40

Fuente: Elaboración propia en base a datos de la DGEEC. Dpto. Concepción. Población estimada y proyectada, según distrito, sexo y grupos de edad, 2000-2025

Igualmente se presentan a continuación las cifras proyectadas de evolución de la población del distrito de Loreto en los últimos 5 años, donde se observa que la diferencia en términos de cantidad de hombres y mujeres se ha sostenido en dicho periodo, es decir que hasta el 2020 hay mayor cantidad de hombres en el distrito.

Tabla 48. Evolución de la población de Loreto en los últimos 5 años (2016-2020)

Distrito de Loreto Población por sexo	Año				
	2016	2017	2018	2019	2020
Hombres	9.782	9.847	9.911	9.973	10.034
Mujeres	8.732	8.761	8.790	8.818	8.846
Población total	18.514	18.608	18.701	18.791	18.879

Fuente: DGEEC. Dpto. Concepción. Población estimada y proyectada, según distrito, sexo y grupos de edad, 2000-2025

Los datos que se presentan a continuación, sobre la proyección de la evolución de la población en los siguientes 5 años, fueron proporcionados por la DGEEC, donde se identifica que existen diferencias en las cifras de proyección de la población al 2020 (tabla anterior), debido a las distritaciones que fueron dándose de manera posterior a la aplicación del censo 2012.

La siguiente tabla señala que para el año 2025 la población de Loreto crecería 1,29%, pasando de 17.312 a 17.538 habitantes.

⁷⁵ DGEEC. Dpto. Concepción. Población estimada y proyectada, según distrito, sexo y grupos de edad, 2000-2025. Disponible en: <https://www.dgeec.gov.py/vt/default.php?publicacion=2>

Tabla 49. Evolución de la población en los siguientes 5 años (2020-2025)

Departamento y distrito	Año					
	2020	2021	2022	2023	2024	2025
Dpto. Concepción	254.976	258.653	62.360	266.072	269.805	273.579
Loreto	17.312	17.362	17.411	17.456	17.497	17.538

Fuente: STP/DGEEC. Paraguay. Proyección de la población por sexo y edad, según distrito, 2000-2025. Revisión 2015.

Hogares, vivienda

En cuanto a la condición de propiedad de la vivienda, en la zona de influencia directa del proyecto, datos otorgados por la DGEEC⁷⁶ indican que en el Distrito de Loreto existe un total de 3.063 viviendas particulares ocupadas, de esta cantidad, el mayor porcentaje de condición de propiedad pertenece a “viviendas propias”, seguidamente la condición de propiedad “prestada o cuidan”, “alquilada” y por último en menor porcentaje, “pagando en cuotas”, “en condominio” y “ocupada de hecho”. Los datos se detallan en la siguiente tabla.

Tabla 50. Condición de propiedad de la vivienda

Condición de propiedad de la vivienda	Departamento de Concepción	Distrito de Loreto
Viviendas particulares ocupadas con personas presentes	42.402	3.063
% Es propia	85,2	92,0
% La están pagando en cuotas	0,9	0,1
% Es en condominio	0,4	0,2
% Es alquilada	5,1	1,6
% Es prestada, la cuidan	7,5	5,6
% Es ocupada de hecho	0,8	0,5
% No informado	0,1	-

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012.

Según el plan local de Salud de Loreto 2014/2016, el área urbana está integrada por los siguientes Barrios: San Francisco, Santo Domingo, Barrio Centro, Nazareth, San Antonio, Fátima, Conavi. Y el área rural integrado por las siguientes compañías: Costa Florida, Loma Florida, San José mí, Zanja Cue San Miguel, Zanja Cue Virgen de Fátima, Zanja Cue Virgen del Rosario, Ycua Pora, Cañada Lourdes, Cañada La Paz, Villa Don Bosco, Costa Pucu, Costa Ferreira, Torales San Marcos, Torales San Roque, Torales Santo Tomas, Zanja Cue Agaigo, Santísima Trinidad, Virgen del Camino, Jhugua Rivas La Asunción, Jhugua Poi, Jhugua Guazú, Isleria, Laguna Cristo Rey, Anderi, Jhugua Rivas San Pablo, Jhugua Bonete, San Isidro, Boquerón, Virgen del Carmen.

Necesidades Básicas Insatisfechas (NBI)

Con respecto a las NBI, se señala que en el 59,5% de los hogares de Loreto se tiene al menos una NBI, el 33,1% de hogares con NBI en infraestructura sanitaria, seguidamente el 21,3% de los hogares con NBI en calidad de vivienda, el 20,7% corresponde a hogares con NBI en capacidad de

⁷⁶ Datos solicitados y proveídos por la DGEEC. Sep. 2020.

subsistencia y por último el 15,8% a los hogares con NBI en acceso a la educación. Los datos se detallan en la siguiente tabla.

Tabla 51. Hogares con NBI, según departamento y distrito

Indicadores de Necesidades Básicas Insatisfechas (NBI) (%)	Total País	Departamento de Concepción	Distrito de Loreto
Hogares particulares ocupados con personas presentes	1.232.496	42.638	3.063
% Hogares con al menos una NBI	43,0	56,2	59,5
% Hogares con NBI en calidad de la vivienda	12,6	19,0	21,3
% Hogares con NBI en infraestructura sanitaria	20,8	29,7	33,1
% Hogares con NBI en acceso a la educación	15,7	20,3	15,8
% Hogares con NBI en capacidad de subsistencia	14,9	19,8	20,7

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012 y Tríptico Necesidades Básicas Insatisfechas (NBI) 2012. Paraguay en base a STP-DGEEC. Censo Nacional de Población y Viviendas 2012.

5.3. Economía

Según datos proveídos por el Plan de Desarrollo Municipal y el Plan Local de Salud, la economía del Distrito de Loreto se sustenta básicamente de la agricultura y la ganadería. Los pobladores del distrito se dedican a proveer los principales productos para el consumo local; sésamo, sandía, melón, mandioca, entre otros, así como también, cría de aves, porcina, caprina y bovina. Por otro lado, en menor proporción, realizan actividades vinculadas al sector de servicio y comercio, considerando que en el distrito se encuentran instituciones públicas y aserraderos que constituyen fuentes de empleo. Se indica, además, que aún se carece de servicios públicos fundamentales y que la población registra una alta tasa de pobreza, siendo el 70% de la población pobre⁷⁷.

Actividades económicas

En cuanto a las actividades económicas del Distrito de Loreto, la información otorgada por la DGEEC indica la prevalencia de las actividades productivas relacionadas al sector primario, seguidamente las actividades del sector terciario y finalmente, el sector secundario. Los datos se detallan en porcentaje en la siguiente tabla.

Tabla 52. Población ocupada por sector económico

Datos de Población	Departamento de Concepción	de Distrito de Loreto
Sector económico de la población ocupada	226.585	16.817
% Primario	40,9	66,1
% Secundario	15,7	8,0
% Terciario	42,2	25,1
% No informado	1,2	0,8

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012.

⁷⁷ Plan de Desarrollo Municipal Loreto. 2016. Disponible en: <http://www.municipalidadloreto.gov.py/wp-content/uploads/2014/11/plan-de-desarrollo-distrital-loreto2016.pdf>

En las comunidades consultadas se mencionó que las actividades productivas se encuentran muy vinculadas aún a la agricultura que progresivamente se va convirtiendo en producción solo para autoconsumo. Según comentaron en la localidad de Virgen del Camino no se comercializa a buen precio, razón por la cual el sésamo por ejemplo ya no es rubro rentable.

Se comentó, además, que una actividad importante en la zona es el trabajo realizado en estancias del Chaco, por día o por trabajo (llamado también “por trato”), también en estancias de la zona y de acuerdo con la temporada, se hace limpiezas de campos; asimismo, personas que trabajan en la capital departamental (frigorífico Concepción). En el caso de las mujeres, se mencionó que las mismas al finalizar el colegio migran a Concepción a buscar trabajo, otras se hacen cargo del hogar, trabajan como docentes o trabajadoras domésticas y que numerosos pobladores migraron a países extranjeros (España, Argentina).

La pequeña ganadería también fue mencionada, afirmando que es para consumo y venta, igualmente la producción y venta de lácteos y derivados además de cría de aves. En Jhugua Po'i se mencionó que el 50% de la población masculina de la comunidad trabaja en estancias de la zona (como peones) y en Jhugua Guazú ocurre lo mismo sólo que resaltaron el hecho de que es población joven la que trabaja de este modo. En Islería se mencionó como actividad importante la pesca en los riachos cercanos.

En la localidad de Anderí, un rubro característico de la comunidad es la elaboración y venta de sombreros de karanda'y, toda la familia se dedica al mismo rubro y la venta es concretada con compradores (patrón) que revenden en Pedro Juan Caballero y Brasil. Como actividad de changa hay motosierristas. En general se mencionó que se cuenta con pequeños comercios y despensas.



Despensa- Hugua Po'i



Ganadería- Virgen del Camino



Comedor -Laguna Cristo rey



Producción Hortícola- Jhugua Guazú

Fuente: Registro fotográfico de trabajo de campo. Equipo consultor. Concepción. Agosto -septiembre 2020

5.4. Acceso a servicios

Acceso a servicios básicos

En el Distrito de Loreto, según los datos proveídos por la DGEEC⁷⁸, en cuanto a energía eléctrica se puede observar que el 91,3% de las viviendas cuenta con este servicio; el 72,2% de las viviendas cuenta con agua corriente; solo el 25,8% de viviendas con saneamiento mejorado; el 9,2% cuenta con servicio de recolección de basura, como pueden verse en la tabla siguiente.

⁷⁸ Datos solicitados y proveídos por la DGEEC. Sep. 2020.

Tabla 53. Viviendas con Acceso a Servicios Básicos

Datos de viviendas particulares Servicios básicos	Departamento de Concepción	Distrito de Loreto
Viviendas particulares ocupadas	42.402	3.063
% Viviendas con energía eléctrica	93,1	91,3
% Viviendas con agua corriente ⁷⁹	74,4	72,2
% Viviendas con desagüe cloacal ⁸⁰	6,3	-
% Viviendas con recolección de basura	22,8	9,2
% Viviendas con saneamiento mejorado	46,9	25,8

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012.

Otros datos extraídos del Plan Local de Salud guardan relación con información respecto al acceso a servicios de agua corriente, se señala que los habitantes del área urbana y rural del distrito de Loreto acceden a este servicio a través de Juntas de Saneamiento.



Sistema de Agua Tercera Zona - Higua Guazú



Sistema de Agua Higua Po'i



Sistema de Agua Santísima Trinidad



Sistema de Agua Virgen del Camino

Fuente: Registro fotográfico de trabajo de campo. Equipo consultor. Concepción. Agosto -septiembre 2020.

Con relación al servicio sanitario, se indica que predomina la letrina común en las viviendas del área rural, así como también en algunas zonas del área urbana. Se estima que un bajo porcentaje de viviendas cuentan con baño moderno, sin embargo, no se dispone del desagüe cloacal⁸¹.

En cuanto a eliminación de residuos, algunas viviendas de la zona urbana tienen acceso al servicio de recolección que es proveído por la Municipalidad, mientras que en las zonas rurales la práctica predominante para eliminar los residuos sólidos es la quema.

La mayor parte de la información presentada fue coincidente con lo mencionado por pobladores involucrados al trabajo de campo en el marco de elaboración del presente estudio, de lo cual se mencionan los siguientes aspectos:

- En las localidades vinculadas al trabajo de relevamiento de información se confirmó que se cuenta con conexión de ANDE en su totalidad, no así con servicio de recolección de basura.

⁷⁹ Incluye: ESSAP, SENASA, red comunitaria, red privada, y pozo artesiano, con cañería fuera de la vivienda pero dentro del terreno o con cañería hasta la cocina y/o baño.

⁸⁰ Incluye: Desagüe por red pública, pozo ciego con y sin cámara séptica. Ver qué decía en el borrador, es importante por q menciona desagüe

⁸¹ MSPBS-CIRD. Plan Local de Salud de Loreto. Periodo 2014-2016. Disponible en: https://www.cird.org.py/institucional/documentos/Plan_Local_Salud_Loreto.pdf

Los residuos se queman o se tiran en hoyos. En la localidad de Jhugua Guazú, en algunas viviendas clasifican las basuras, ya que tienen chacras y las utilizan para abono.

- En las 7 localidades involucradas se cuenta con internet y teléfonos celulares. En el caso de la comunidad Anderí comentaron que la conexión tiene muchas falencias.
- Ninguna localidad visitada cuenta con desagüe cloacal.
- En la totalidad de las localidades todavía se utiliza letrinas (Anderí, Jhugua Guazú, y Santísima Trinidad), sin embargo, en varias de ellas mencionaron contar ya con baños modernos o semi-modernos, incluyendo la utilización de pozo ciego. Tal es el caso de Laguna Cristo Rey donde el 70% de familias ya utiliza baño moderno/pozo ciego.
- En las localidades mencionaron abastecerse de agua mediante pozos para auto consumo en algunos casos y para uso doméstico (también para consumo animal) en general, en el caso de la localidad Virgen del Camino, 18 familias aproximadamente dependen de 1 pozo. Solo en una localidad se mencionó no contar con comisión o junta de agua y se afirmó no contar con asistencia de SENASA (Islería).

Educación

Con base a los datos extraídos del Plan Local de Salud y de documentación del Ministerio de Educación y Ciencias, en relación al acceso a la educación en el distrito de Loreto, se identifica que la mayoría de los niños, niñas y adolescentes acceden a la educación escolar básica y a la educación media en las instituciones públicas ubicadas en el mismo distrito.

Según datos obtenidos del Ministerio de Educación y Ciencias (MEC)⁸², en el Distrito de Loreto se encuentran 38 establecimientos educativos, de la totalidad, 25 tienen modalidad de Educación Inicial (4 en área urbana y 21 en rural), 33 establecimientos cuentan con modalidad de Educación Escolar Básica (5 en área urbana y 28 en rural), 11 establecimientos con modalidad de Educación Media (2 en área urbana y 9 en el rural) y un establecimiento con modalidad de Educación Media Abierta en el área rural.

Tabla 54. Nivel educativo por zona

Nivel educativo	Zona		
	Total	Urbana	Rural
Educación inicial	25	4	21
Escolar Básica	33	5	28
Educación media	11	2	9
Educación media abierta	1	-	1
Total	70	11	59

Fuente: elaboración en base a los datos del MEC- Datos abiertos, Establecimientos escolares 2019 y la Guía Completa de Educación en Paraguay.

Es importante aclarar que existen establecimientos que tienen más de una institución y que en las instituciones podría impartirse más de una modalidad.

En lo que refiere a la educación superior, en el Departamento de Concepción existen diversas instituciones que ofrecen formación profesional, pública y privada, con una gran concentración en

⁸² https://datos.mec.gov.py/data/establecimientos_escolares_priorizados_elegibles_fonacide

la capital departamental. La mayoría de las universidades ofrece carreras en humanidades, notándose un déficit en la oferta de carreras de las ciencias exactas.

Por otra parte, cabe señalar que el distrito de Loreto cuenta con un Centro de Alfabetización para jóvenes y adultos que no culminaron la educación primaria. Así también están habilitadas escuelas de danza, guitarra, entre otros.



Escuela Virgen del Rosario-Anderi



Escuela Santísima Trinidad - Santísima Trinidad



Escuela Básica N° 1723 Laguna Cristo Rey



Colegio Nacional Sagrado Corazón de Jesús- Jhugua Guazú

Fuente: Registro fotográfico de trabajo de campo. Equipo consultor. Concepción. Agosto -septiembre 2020.

En cuanto al acceso a servicios básicos como energía eléctrica en los establecimientos educativos, 29 de la totalidad cuentan con este servicio por parte de la ANDE. Existen diferentes medios por los cuales estas instituciones acceden al agua, en su mayoría a través de SENASA, en menor proporción por medio de pozo artesiano, junta de saneamiento, red comunitaria.

Entre las problemáticas en el acceso a la educación se indican, alta deserción en la modalidad escolar básica y media, atendiendo la necesidad económica de los jóvenes de este distrito y la falta de empleo local que genera la migración de los jóvenes a la capital de Concepción u otras ciudades como Asunción. Por otro lado, si bien existen universidades públicas y privadas se cuestiona la calidad educativa de las mismas. Ante esta situación se cuenta con el registro de las carreras acreditadas en el Departamento de Concepción, por la Agencia Nacional de Evaluación y Acreditación de la Educación Superior (ANEAES).

A continuación, se presenta cada institución educativa y sus características:

Tabla 55. Instituciones educativas por zona, modalidad y acceso a servicios básicos.

Instituciones	Distrito de Loreto				
	Localidad	Zona	Modalidad	Agua	Energía
Escuela Básica N° 4919 Virgen de Fátima y Centro 1 -12	B° Fátima	Urbana	E.I., E.E.B.	SENASA	ANDE
Escuela Básica N° 29 Expectación Bernal y Sede Tutorial N° 36	Fátima	Urbana	E.I., E.E.B., E.M.	Junta de Saneamiento	ANDE
Colegio Nacional John F. Kennedy	Fátima	Urbana	E.E.B.,E.M.	SENASA	ANDE
Escuela Básica N° 1312 Vitalina Torres Vda. de Garcete	Centro	Urbana	E.I., E.E.B.	SENASA	ANDE
Centro Integral Educativo Divino Niño Jesús	Centro	Urbana	E.I.	SENASA	ANDE
Colegio Nacional Nuestra Señora de Loreto	Santo Domingo	Urbana	E.E.B.	SENASA	ANDE

Instituciones	Distrito de Loreto				
	Localidad	Zona	Modalidad	Agua	Energía
Escuela Básica N° 4921 Virgen del Rosario	Anderi	Rural	E.E.B.	-	-
Escuela Básica N° 1720 San Roque	Beato Roque	Rural	E.I., E.E.B., E.M.	Red Comunitaria	ANDE
Escuela Básica N° 2092 Prof. María Cantalicia González Vda. de Chamorro	Beato Roque González	Rural	E.E.B.	SENASA	ANDE
Escuela Básica N° 590 Josefina Ojeda Maidana	Cañada La Paz	Rural	E.I., E.E.B.	Pozo Artesiano	ANDE
Colegio Nacional Cañada La Paz	Cañada La Paz	Rural	E.M.	SENASA	ANDE
Escuela Básica N° 2077 Virgen de Lourdes	Cañada Lourdes	Rural	E.I., E.E.B.	SENASA	ANDE
Escuela Básica N° 1729 Santo Domingo Sabio	Costa Pucu	Rural	E.I., E.E.B.	SENASA	ANDE
Escuela Básica N° 4335	Domínguez Nigó	Rural	E.E.B.	-	-
Escuela Básica N° 2669 Intendente Rodolfo Schreiber	Isleria	Rural	E.I., E.E.B.	-	-
Escuela Básica N° 2082 Divino Niño Jesús	Jhugua Bonete	Rural	E.I., E.E.B., E.M.	Pozo Artesiano	ANDE
Colegio Nacional Sagrado Corazón de Jesús	Jhugua Guazu	Rural	E.M.	Pozo Artesiano	ANDE
Escuela Básica N° 1724 Monseñor Alejo del Carmen Obelar	Jhugua Guazu	Rural	E.E.B.	Pozo Artesiano	ANDE
Escuela Básica N° 4931 María Auxiliadora	Jhugua Guazu	Rural	E.I., E.E.B.	Pozo Artesiano	ANDE
Escuela Básica N° 1727 San Rafael	Jhugua Po'i	Rural	E.I., E.E.B., E.M.	Pozo Artesiano	ANDE
Escuela Básica N° 2083 Ntra. Sra. de la Asunción	Jhugua Rivas	Rural	E.I., E.E.B., E.M.A	SENASA	ANDE
Escuela Básica N° 1726 San Pablo	Jhugua Rivas San Pablo	Rural	E.I., E.E.B., E.M.	Pozo Artesiano	ANDE
Escuela Básica N° 4934 San Vicente	Jhugua Rivas San Vicente	Rural	E.I., E.E.B.	-	-
Escuela Básica N° 4932 Virgen del Carmen	Jhugua Rivas Virgen del Carmen	Rural	E.I., E.E.B.	-	-
Escuela Básica N° 1723 Lic. Andrés Tadeo Morel C.	Laguna Cristo Rey	Rural	E.I., E.E.B., E.M.	-	-
Escuela Básica N° 6693 María Auxiliadora	Potrero Tacuara	Rural	E.E.B.	-	-
Escuela Básica N° 1728 Loreto Arce	San José mi	Rural	E.I., E.E.B.	SENASA	ANDE
Escuela Básica N° 2078 San Miguel	Sanja Cué	Rural	E.E.B.	SENASA	ANDE
Escuela Básica N° 594 Virgen de Fátima	Sanja Cue, Fatima	Rural	E.I.	SENASA	ANDE
Colegio Nacional Santa Librada y Escuela Básica N° 591 Guillermo Coronel	Sanja Cue Santa Librada	Rural	E.I., E.E.B., E.M.	SENASA	ANDE

Instituciones	Distrito de Loreto				
	Localidad	Zona	Modalidad	Agua	Energía
Escuela Básica N° 2079 Virgen del Rosario	Sanja Cue del Virgen del Rosario	Rural	E.I., E.E.B.	SENASA	ANDE
Escuela Básica N° 6970 Santísima Trinidad	Santísima Trinidad	Rural	E.E.B.	Pozo Artesiano	ANDE
Escuela Básica N° 4926 Pbro. Néstor Echague Galeano	Villa Don Bosco	Rural	E.I., E.E.B.	SENASA	ANDE
Escuela Básica N° 2084 Virgen del Camino	Virgen del Camino	Rural	E.I., E.E.B.	SENASA	ANDE
Escuela Básica N° 1725 Virgen de las Mercedes	Ycua Porâ	Rural	E.I., E.E.B.	SENASA	ANDE
Colegio Nacional Ycuá Porâ	Ycua Porâ	Rural	E.M.	Red Comunitaria	ANDE
Escuela Básica N° 4927 San Marcos	San Marcos	Rural	E.E.B.	-	-
Escuela Básica N° 11892 Las Palmas	Las Palmas	Rural	E.I., E.E.B.	-	-

Fuente: elaboración en base a los datos del MEC- Datos abiertos, Establecimientos escolares 2019 y la Guía Completa de Educación en Paraguay.

Formación profesional y técnica

En lo que refiere al acceso a la formación profesional y técnica, dentro del Departamento de Concepción se observan varias ofertas de enseñanza, según datos extraídos de la Información complementaria en el marco de los estudios sociales (Componente Industrial-Pág. 18) los cuales se especifican en la siguiente tabla.

Tabla 56. Instituciones de formación de carreras técnicas

Instituciones	Distritos	Carreras técnicas
Infoservice	Concepción Loreto San Pedro del Ykuamandyju	Operador básico Auxiliar informática Administración y finanzas Asistente de supermercado y cajero Diseño gráfico publicitario Marketing digital Excel profesional Word profesional Inglés

Fuente: Información complementaria en el marco de los estudios sociales (Componente Industrial-Pág. 18)

Salud

Según datos publicados por el Ministerio de Salud Pública y Bienestar Social, el distrito de Loreto cuenta con 5 centros asistenciales de salud pública, distribuidos en la zona, los cuales se mencionan a continuación.

- Centro de Salud Loreto
- USF Huguá Guazu
- USF Jhuguá Poi
- USF Zanja Cue

- USF Cañada la Paz



USF-Jhugua Guasu



Dispensario de Salud- Huguá Po'i



USF- Huguá Po'i

El Plan Local de Salud indica que el distrito cuenta además con otros tipos de servicios orientados a la atención en la salud de sus habitantes, como:

- 1 Centro de Salud
- 2 Puestos de Salud: Sanja Cue y Jhugua Guazu
- 1 USF en Jhugua Poi
- 1 Dispensario médico en Huguá Rivas
- 1 Farmacia Social administrado por el Consejo Local de Salud
- 6 Farmacias privadas
- 15 Parteras empíricas

Además, el Plan Local de Salud indica que el Centro de Salud cuenta con 38 funcionarios, 34 corresponden a personal de blanco y 4 administrativos, de los cuales 14 son contratados por el Consejo Local de Salud (41%). Tipo de personal de salud: 3 médicos, 8 licenciadas en enfermería, 5 licenciadas en obstetricia, 2 auxiliares en obstetricia, 10 auxiliares técnicos, 3 técnicos en enfermería, 1 licenciada en Farmacia, 1 técnico en Farmacia, 2 administrativos, 1 peón de patio, 1 electricista, 1 Sereno.

De acuerdo a esta fuente, se desarrollan en el distrito actividades de educación comunitaria con el apoyo del personal de salud, en los centros asistenciales, en los clubes de madres, en capillas y audiciones radiales, esto a fin de fomentar a la población en general acudir a las unidades de salud y llevar una vida saludable.

Según datos brindados por los pobladores de las localidades visitadas en el marco del trabajo de campo se presta actualmente los siguientes servicios:

Todas las consultas de carácter no respiratorio como Hipertensos y pacientes crónicos.

- Urgencias leves y se deriva de acuerdo al caso.
- Control prenatal
- Testeo rápido VIH Sida Hepatitis B, Chagas (de carácter voluntario) pero para las embarazadas y sus parejas son obligatorias.

- Vacunación de niños, ancianos y adultos,
- Consultas domiciliarias
- Test para recién nacidos.

Según indicaron, se realiza atención primaria en la comunidad, buscando que sea una atención integral (“vemos todo, si hay violencia intrafamiliar, los que fuman o los que son alcohólicos”).

Acceso a tecnologías de información y medios de comunicación (TIC) y bienes de confort

Con relación al acceso a TIC, según los datos facilitados por la DGEEC, en el Distrito de Loreto, el 83,2% de las viviendas cuentan con radio; del 80,0% de las viviendas que cuenta con televisor, el 8,2% tiene TV cable; el 4,4% de las viviendas cuentan con teléfono fijo; el 84,1% de las viviendas con teléfono celular; y del 5,4% de viviendas con computadora, el 4,3% tiene conectado a internet; el 5,4% de las viviendas cuenta con antena parabólica.

Tabla 57. Equipos domésticos y TIC

Acceso a TIC	Departamento de Concepción	Distrito de Loreto
Viviendas particulares ocupadas con personas presentes	42.402	3.063
% Viviendas con radio	80,6	83,2
% Viviendas con televisor	79,8	80,0
% Viviendas con teléfono fijo	8,0	4,4
% Viviendas con teléfono celular	83,3	84,1
% Viviendas con computadora	11,9	5,4
% Viviendas con computadora conectada a internet	9,2	4,3
% Viviendas con antena parabólica	10,8	4,8
% Viviendas con TV cable	13,4	8,2

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012.

A través del trabajo de campo se pudo acceder a información respecto a los siguientes medios de comunicación como:

- Tipo de medios de comunicación utilizados: Radio, Televisión, Celulares, Redes Sociales.
- Emisoras radiales: Radio Cristiana 107.5 Misión de Dios, Tekopyahu de Loreto, Regional AM de Concepción, Ypané de Concepción, Radios de Paso Barreto y Arroyito, la 89.9 de Horqueta, Radio Aquidabán
- Canales de televisión: Canal 9 SNT, Telefuturo y canales por cable y antena satelital.
- Celulares con internet: a través de mensajería, llamadas y grupos de whatsapp (en algunas comunidades se cuenta con mala conexión a internet)

En relación a los bienes de confort en las viviendas del Distrito de Loreto, según datos entregados por la DGEEC, el 64,2% de las viviendas cuentan con heladeras; el 44,8% con lavarropas; el 16,3 % con video/DVD; el 2,2% con termo-calefón; el 16,0% con ducha eléctrica; el 6,4% con aire acondicionado; el 11,7% con horno microondas; el 5,0% con automóvil/camioneta y el 73,8% con moto.

Tabla 58. Equipos domésticos y bienes de confort

Bienes de confort	Departamento de Concepción	Distrito de Loreto
Viviendas particulares ocupadas con personas presentes	42.402	3.063
% Viviendas con heladera	68,1	64,2
% Viviendas con lavarropas	50,9	44,8
% Viviendas con video/DVD	21,2	16,3
% Viviendas con termo-calefón	4,0	2,2
% Viviendas con ducha eléctrica	25,7	16,0
% Viviendas con acondicionador de aire	15,2	6,4
% Viviendas con horno microondas	14,4	11,7
% Viviendas con automóvil/camioneta	9,9	5,0
% Viviendas con moto	74,3	73,8

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012.

6. Distrito de Arroyito

6.1. Características generales



Municipalidad de Arroyito Fuente: La Nación.⁸³

Arroyito es un distrito ubicado en la zona este del departamento de Concepción, a 78 kilómetros de la capital departamental. El 22 de noviembre del año 2016 fue declarado distrito, separándose de Horqueta, por Ley N° 5.742. Se encuentra al norte de la capital del país, Asunción, a 390 Kilómetros y las principales vías de comunicación terrestre que conectan a ambas ciudades son las rutas 3 “General Elizardo Aquino” y 5 “General Bernardino Caballero”.

Según se indica en una de las fuentes de consulta “Desde el año 2013 su población inició la cruzada para lograr la autonomía distrital alegando el notorio crecimiento poblacional⁸⁴” lo que implicó posteriormente la desafectación de una superficie de aproximadamente 88.000 hectáreas que dependían del distrito de Horqueta (880 km²). En cuanto al gobierno municipal, el intendente y concejales municipales fueron electos en el mes de marzo del 2017, según lo establecido por el Tribunal Superior de Justicia Electoral (TSJE).

6.2. Datos de Población

Según datos de la DGEEC, la proyección de población del Departamento de Concepción es de 254.976, perteneciendo al Distrito de Arroyito 13.181 habitantes. Esta totalidad representa el 5,16% de la población del departamento.

De estos datos publicados, se puede notar un pequeño aumento en la proyección de la población del distrito de Arroyito en los siguientes 5 años, presentados en la siguiente tabla.

Tabla 59. Evolución de la población en los siguientes 5 años (2020-2025)

Departamento y distrito	Año					
	2020	2021	2022	2023	2024	2025
Dpto. Concepción	254.976	258.653	62.360	266.072	269.805	273.579
Arroyito	13.181	13.398	13.617	13.836	14.057	14.280

Fuente: STP/DGEEC. Paraguay. Proyección de la población por sexo y edad, según distrito, 2000-2025. Revisión 2015.

⁸³ Disponible en: <https://www.lanacion.com.py/pais/2020/01/30/exigen-en-arroyito-imputacion-de-intendente-e-intervencion-de-comuna/>

⁸⁴ Diario ABC color. Disponible en: <https://www.abc.com.py/nacionales/arroyito-convertido-en-distrito-1540198.html>

Hogares, vivienda

En relación a la condición de propiedad de la vivienda, según datos entregados por la DGEEC⁸⁵, en el Distrito de Arroyito, existen 2.011 viviendas particulares ocupadas, de las cuales el 91,8% corresponde a condición propia, el 7% a condición de prestada o cuidada, el 0,5% a ocupada de hecho, el 0,5% a alquilada y con el menor porcentaje, el 0,1% a en condominio. Todos estos presentados en la siguiente tabla.

Tabla 60. Condición de propiedad de la vivienda

Condición de propiedad de la vivienda	Departamento de Concepción	Distrito de Arroyito
Viviendas particulares ocupadas con personas presentes	42.402	2.011
% Es propia	85,2	91,8
% La están pagando en cuotas	0,9	0,0
% Es en condominio	0,4	0,1
% Es alquilada	5,1	0,5
% Es prestada, la cuidan	7,5	7,0
% Es ocupada de hecho	0,8	0,5
% No informado	0,1	-

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012.

Según se indica en una de las fuentes consultadas, el sector urbano del distrito se encuentra poco desarrollado. Cuenta con 2 asentamientos campesinos que representan a más de la mitad de su población, como ser el asentamiento Arroyito con sus 6 núcleos (barrios). Este distrito cuenta con las siguientes compañías: Calle 13 Mata Burro, Calle 14-Zona Norte (San Antonio, Zona Sur (San Agustín), Calle 15, Calle 16, Calle 17, Calle 18, Arroyito, Acapitigo, Tacuara, Cuero Fesco, Arroyo de Oro y Primavera.

Necesidades Básicas Insatisfechas (NBI)

Tomando como fuente a la DGEEC, tanto en el tríptico de Necesidades Básicas Insatisfechas (NBI)⁸⁶, como en los datos sobre Medición de las NBI a partir del Censo Nacional de Población y Viviendas 2012⁸⁷, se indica que en el Distrito de Arroyito el 68,6% de los hogares cuenta con al menos una NBI; el 40,5% de hogares con NBI en infraestructura sanitaria; el 33% de los hogares con NBI en acceso a la educación; el 17,5% de los Hogares con NBI en capacidad de subsistencia y el 17,4% de los hogares con NBI en calidad de la vivienda. A continuación, pueden observarse las cifras en la siguiente tabla.

Tabla 61. Hogares con NBI, según departamento y distrito

Indicadores de Necesidades Básicas Insatisfechas (NBI) (%)	Total hogares	Departamento de Concepción	Distrito de Arroyito
Hogares particulares ocupados con personas presentes	1.232.496	42.638	2.012
% Hogares con al menos una NBI	43,0	56,2	68,6

⁸⁵ Datos solicitados y proveídos por la DGEEC, Sep. 2020.

⁸⁶ DGEEC. Necesidades Básicas Insatisfechas (NBI) 2012 PARAGUAY. Disponible en: <https://www.dgeec.gov.py/Publicaciones/Biblioteca/investigacion%20tematica/Triptico-de-necesidades-insatisfechas-NBI-2012.pdf>

⁸⁷ Datos solicitados y proveídos por la DEGECC, Sep. 2020.

Indicadores de Necesidades Básicas Insatisfechas (NBI) (%)	Total hogares	Departamento de Concepción	Distrito de Arroyito
% Hogares con NBI en calidad de la vivienda	12,6	19,0	17,4
% Hogares con NBI en infraestructura sanitaria	20,8	29,7	40,5
% Hogares con NBI en acceso a la educación	15,7	20,3	33,6
% Hogares con NBI en capacidad de subsistencia	14,9	19,8	17,5

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012 y Tríptico Necesidades Básicas Insatisfechas (NBI) 2012. Paraguay en base a STP-DGEEC. Censo Nacional de Población y Viviendas 2012.

6.3. Economía

Actividades económicas

Según los datos proveídos por la DGEEC, en el Distrito de Arroyito predomina el sector primario con porcentaje muy elevado, 80,3%, seguido del sector terciario con 15,5% y finalmente con un porcentaje mucho menor, el sector secundario, con el 4% como se puede observar en la siguiente tabla, en la que además se especifican las cifras en relación con el departamento.

Tabla 62. Población ocupada por sector económico - nivel departamental y distrital

Datos de Población	Departamento de Concepción	Distrito de Arroyito
Sector económico de la población ocupada ⁸⁸	226.585	11.540
% Primario	40,9	80,3
% Secundario	15,7	4,0
% Terciario	42,2	15,5
% No informado	1,2	0,3

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012.

6.4. Acceso a Servicios

Acceso a servicios básicos

En relación al acceso a servicios básicos, en el Distrito de Arroyito, en la tabla 66 se presentan los datos proveídos por la DGEEC⁸⁹, en la que puede observarse que en la mayoría de las viviendas se cuenta con servicio de energía eléctrica (94,6%); seguido de las viviendas que cuentan con agua corriente (58,2%); y en menor proporción las viviendas con saneamiento mejorado. Apenas el 0,1% cuenta con servicio de recolección de basura.

Tabla 63. Viviendas con Acceso a Servicios Básicos

Datos de viviendas particulares Servicios básicos	Departamento de Concepción	Distrito de Arroyito
Viviendas particulares ocupadas con personas presentes	42.402	2.011
% Viviendas con energía eléctrica	93,1	94,6

⁸⁸ Datos solicitados y proveídos por la DGEEC. Sep. 2020.

⁸⁹ Datos solicitados y proveídos por la DGEEC. Sep. 2020.

Datos de viviendas particulares Servicios básicos	Departamento de Concepción	Distrito de Arroyito
% Viviendas con agua corriente ⁹⁰	74,4	58,2
% Viviendas con desagüe cloacal ⁹¹	6,3	-
% Viviendas con recolección de basura	22,8	0,1
% Viviendas con saneamiento mejorado	46,9	19,0

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012.

Como se indica en el Plan de desarrollo municipal⁹³, en el distrito existen deficiencias relacionadas a la vivienda y el hábitat. Asimismo, altos niveles de pobreza. Según el Mapa de Pobreza por Localidad, publicado por la STP, Arroyito cuenta con un nivel de pobreza superior al 40%, más acentuado principalmente en los Núcleos del 1 al 7.



Escuela Graduada N° 2475 Santa María de Cuero Fresco-
Fuente: Concepción al Día⁹²

Educación

Con respecto al acceso a la educación de la población del distrito de Arroyito, según datos oficiales del MEC, se cuenta con 32 instituciones educativas, de las cuales 24 tienen modalidad de Educación Inicial; 27 instituciones cuentan con modalidad de Educación Escolar Básica, todas ubicadas en el área rural y 6 instituciones con modalidad de Educación Media, de estas instituciones 1 es de especialidad Técnico Agropecuario, las mismas instituciones están asentadas 1 área urbana y 5 área rural. Estos datos se pueden observar en la siguiente tabla.

Tabla 64. Nivel educativo por zona

Nivel educativo	Total	Zona	
		Urbana	Rural
Educación inicial	24	-	24
Escolar Básica	27	-	27
Educación media	6	1	5
Total	57	1	56

Fuente: elaboración en base a los datos del MEC- Datos abiertos, Establecimientos escolares 2019

Es importante aclarar que existen establecimientos que tienen más de una institución y que en las instituciones podría impartirse más de una modalidad.

A continuación, se presenta cada institución educativa y sus características:

⁹⁰ Incluye: ESSAP, SENASA, red comunitaria, red privada, y pozo artesiano, con cañería fuera de la vivienda pero dentro del terreno o con cañería hasta la cocina y/o baño.

⁹¹ Incluye: Desagüe por red pública, pozo ciego con y sin cámara séptica.

⁹² Disponible en: <https://www.concepcionaldia.com/escuela-de-arroyito-no-tiene-aulas-agua-potable-ni-almuerzo-escolar/>

⁹³ Documento borrador del Plan de Desarrollo Municipal del Distrito de Arroyito 2016-2020.

Tabla 65. Instituciones educativas según ubicación, modalidad y acceso a servicios básicos

Instituciones Arroyito	Localidad	Zona	Asentamiento	Modalidad	Agua	Energía
Colegio Nacional Mayor Julio D. Otaño	Arroyito	Urbana	Colonia Ex - Combatiente	E.M.	Pozo Artesiano	ANDE
Escuela Básica N° 443 Mayor Julio D. Otaño	Arroyito	Rural	Colonia Ex - Combatiente	E.I. y E.E.B.	SENASA	ANDE
Colegio Nacional Pablo Emiliano Quevedo Cordero	Arroyo de Oro	Rural	-	E.M.	SENASA	ANDE
Escuela Básica N° 1704 Pablo Emiliano Quevedo Cordero	Arroyo de Oro	Rural	-	E.I. y E.E.B.	SENASA	ANDE
Escuela Básica N° 2841	Asentamiento N° 1 - Arroyito	Rural	Asentamiento Arroyito	E.I. y E.E.B.	Pozo Artesiano	ANDE
Escuela Básica N° 4601 Defensores de los Derechos del Niño	Asentamiento N° 2 - Arroyito	Rural	Asentamiento Arroyito	E.I. y E.E.B.	Pozo Artesiano	ANDE
Escuela Básica N° 4354 Priv. Subv. San Roque González de S. Cruz	Asentamiento N° 2 - Arroyito	Rural	Asentamiento Arroyito	E.I. y E.E.B.	Pozo Artesiano	ANDE
Escuela Básica N° 4602 12 de Abril y Colegio Nacional 12 de Abril	Asentamiento N° 3 - Arroyito	Rural	Asentamiento Arroyito	E.E.B. y E.M.	Pozo Artesiano	ANDE
Escuela Básica N° 2840 Priv. Subv. Mons. Anibal Maricevich	Asentamiento N° 3 - Arroyito	Rural	Asentamiento Arroyito	E.I. y E.E.B.	Pozo Artesiano	ANDE
Colegio Técnico Agrop. Augusto Roa Bastos	Asentamiento N° 3 - Arroyito	Rural	Asentamiento Arroyito	E.M.	Privado	ANDE
Escuela Básica N° 4352 Priv. Subv. Santa Catalina	Asentamiento N° 4 - Arroyito	Rural	Asentamiento Arroyito	E.I. y E.E.B.	SENASA	ANDE
Escuela Básica N° 4950 Mártires de Acosta Ñu	Asentamiento N° 4 - Arroyito	Rural	Asentamiento Arroyito	E.I. y E.E.B.	SENASA	ANDE
Escuela Básica N° 4790 Mons. Anibal Maricevich Fleitas	Asentamiento N° 5 - Arroyito	Rural	Asentamiento Arroyito	E.I. y E.E.B.	Pozo Artesiano	ANDE
Escuela Básica N° 4355 Priv. Subv. Sagrada Familia	Asentamiento N° 5 - Arroyito	Rural	Asentamiento Arroyito	E.I. y E.E.B.	Pozo Artesiano	ANDE
Escuela Básica N° 4353 Priv. Subv. Moisés Bertóni	Asentamiento N° 6 - Arroyito	Rural	Asentamiento Arroyito	E.I. y E.E.B.	Pozo Artesiano	ANDE
Escuela Básica N° 6456 Prof. Dr. Luis María Argaña	Asentamiento N° 6 - Arroyito	Rural	Asentamiento Arroyito	E.I. y E.E.B.	Pozo Artesiano	ANDE

Instituciones Arroyito	Localidad	Zona	Asentamiento	Modalidad	Agua	Energía
Escuela Básica N° 3213 Héroes del Chaco	Asentamiento N° 7 - Arroyito	Rural	Asentamiento Arroyito	E.I. y E.E.B.	-	-
Escuela Básica N° 4341 San Andrés	Calle 16 - Arroyito	Rural	Colonia Ex - Combatiente	E.I. y E.E.B.	SENASA	ANDE
Escuela Básica N° 4949 Acosta Ñu	Calle 16 - Arroyito	Rural	-	E.I. y E.E.B.	SENASA	ANDE
Escuela Básica N° 6696 Don Serapio Valenzuela	Calle 18 - Arroyito	Rural	-	E.I. y E.E.B.	Pozo Común	ANDE
Escuela Básica N° 1719 Gral. Bernardino Caballero y Colegio Nacional San Juan	Cañada San Juan	Rural	-	E.I., E.E.B. y E.M.	SENASA	ANDE
Escuela Básica N° 2460 Niño Milagroso	Colonia Choferes del Chaco	Rural	-	E.E.B.	-	-
Escuela Básica N° 2457 Santa María	Cuero Fresco	Rural	-	E.I. y E.E.B.	Pozo Común	ANDE
Escuela Básica N° 3979 Cnel. Panchito López	Cuero Fresco	Rural	-	E.I. y E.E.B.	Pozo Común	ANDE
Escuela Básica N° 4948 Don Alfonso Valiente	Lucero Cue - Arroyito	Rural	-	E.E.B.	-	-
Escuela Básica N° 4935 Adela Speratti	Primavera	Rural	-	E.I. y E.E.B.	SENASA	ANDE
Escuela Básica N° 4937 San Blas	Primavera	Rural	-	E.I. y E.E.B.	SENASA	ANDE
Colegio Nacional Mcal. Francisco Solano López	Tacuara	Rural	-	E.M.	Pozo Artesiano	ANDE
Escuela Básica N° 1717 Mcal. Francisco Solano López	Tacuara	Rural	-	E.I. y E.E.B.	SENASA	ANDE
Escuela Básica N° 4146 6 de Enero	Tacuara	Rural	-	E.I. y E.E.B.	Pozo Artesiano	ANDE
Escuela Básica N° 4943 San Antonio	Tacuara	Rural	-	E.I. y E.E.B.	Pozo Artesiano	ANDE

Fuente: Elaboración en base a los datos del MEC- Datos abiertos, Establecimientos escolares 2019 y la Guía Completa de Educación en Paraguay.

Formación profesional y técnica

En cuanto a formación profesional y técnica, el SNPP habilitó dos cursos de Capacitación y Formación laboral, Informática y Ayudante Electricista, capacitación para jóvenes y adultos⁹⁴; curso de especialidad de Robótica Pitsco con la intención de promover la Ciencia, Tecnología, Ingeniería y Matemáticas (STEM) en la zona⁹⁵ y cursos de Secretariado ejecutivo, Productor de cultivos de renta,

⁹⁴ SNPP (2017). Disponible en: <https://www.snpp.edu.py/9-noticias/11957-snpp-arroyito-habilita-cursos-de-capacitaci%C3%B3n-y-formaci%C3%B3n-laboral.html>

⁹⁵ Concepción al día (2020). Disponible en: <https://www.concepcionaldia.com/snpp-habilita-curso-de-robotica-en-arroyito/>

Operador de computadoras, Ayudante de cocina, Cocina básica, Cultivo de mandioca y Cultivo de maíz⁹⁶.

Salud

Según datos extraídos de la página oficial del MSPyBS, el Distrito de Arroyito cuenta con 4 Unidades de Salud de la Familia y 1 Puesto de Salud⁹⁷, se citan a continuación:

- USF - Arroyito (Ruta 5)
- USF - Cuero Fresco
- USF - Asentamiento Arroyito Núcleo 3
- USF - Asentamiento Arroyito Núcleo 6
- Puesto de Salud - Asentamiento Arroyito Núcleo 7

Itaipú Binacional⁹⁸ financió en el distrito de Arroyito la construcción de 1 USF que fue inaugurada en el mes de agosto de 2020. La infraestructura de la misma cuenta con consultorios clínico, pediátrico y ginecológico, sala de parto, sala de rayos x, cocina, comedor y servicios sanitarios totalmente renovados y adecuados a personas con discapacidad, dispone de equipamientos médicos para cirugías menores y curaciones, estufa para esterilización, otoscopio, estetoscopio, oftalmoscopio, camilla ginecológica, balón de oxígeno, entre otros instrumentos y cuenta con un acceso para ambulancias a fin de facilitar el traslado de pacientes a otros centros de mayor complejidad, buscando cubrir la salud preventiva de al menos 5.000 pobladores.

Acceso a Tecnologías de información y medios de comunicación (TIC) y bienes de confort.

En relación al acceso a TICs, los datos facilitados por la DGEEC indican que en el Distrito de Arroyito, en la mayoría de las viviendas cuentan con teléfonos celulares, con radio y con televisor; y en menor proporción cuentan con antenas parabólicas, con computadoras; con internet, TV cable y teléfonos fijos, como se puede observar en la siguiente tabla:

Tabla 66. Equipos domésticos y acceso a TIC

Acceso a TIC	Departamento de Concepción	Distrito de Arroyito
Viviendas particulares ocupadas con personas presentes	42.402	2.011
% Viviendas con radio	80,6	80,3
% Viviendas con televisor	79,8	68,9
% Viviendas con teléfono fijo	8,0	0,7
% Viviendas con teléfono celular	83,3	83,1
% Viviendas con computadora	11,9	2,7
% Viviendas con computadora conectada a internet	9,2	1,1
% Viviendas con antena parabólica	10,8	11,8
% Viviendas con TV cable	13,4	0,9

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012.

⁹⁶ SNPP (2020). Disponible en: <https://www.facebook.com/snpp.paraguay/posts/1249901715198679/>

⁹⁷ MSPyBS disponible en <https://www.mspbs.gov.py/donde-consulta.php>

⁹⁸ Página Web Itaipu Binacional, Responsabilidad Social. Disponible en : <https://www.itaipu.gov.br/es/sala-de-prensa/noticia/usf-de-arroyito-financiada-por-itaipu-cubrir-la-salud-preventiva-de-5000-per>

Según se indica en el Plan de Desarrollo Municipal (borrador) se cuenta con dos estaciones de radio FM; Cristal FM y Arroyito comunicaciones 102.5.

En cuanto al acceso a bienes de confort en las viviendas del Distrito, la información otorgada por la DGEEC señala que un alto porcentaje de las viviendas cuentan con motocicletas; seguido de heladeras y lavarropas; en menor proporción, se trata de viviendas que cuentan con video/DVD; ducha eléctrica; automóvil/camioneta; horno microondas; y muy pocas viviendas cuentan con aire acondicionado y termo-calefón, como se puede observar en la siguiente tabla.

Tabla 67. Equipos domésticos y Bienes de confort

Bienes de confort	Departamento de Concepción	Distrito de Arroyito
Viviendas particulares ocupadas con personas presentes	42.402	2.011
% Viviendas con heladera	68,1	63,0
% Viviendas con lavarropas	50,9	44,2
% Viviendas con video/DVD	21,2	15,9
% Viviendas con termocalefón	4,0	1,1
% Viviendas con ducha eléctrica	25,7	8,9
% Viviendas con acondicionador de aire	15,2	1,8
% Viviendas con horno microondas	14,4	4,1
% Viviendas con automóvil/camioneta	9,9	4,6
% Viviendas con moto	74,3	76,7

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012.

7. Distrito de Horqueta

7.1. Características generales



Acceso ciudad de Horqueta⁹⁹

Horqueta se encuentra ubicada a 50 Km de la Ciudad de Concepción y a 434 km¹⁰⁰ de Asunción, a 172Km de Punta Porá (Brasil). Limita al norte con los distritos de Loreto, Concepción y el Río Aquidaban, al sur con el Río Ypané, al este con el distrito de Yby Yaú y al oeste con los distritos de Concepción y Belén. Contaba con una superficie de 2.925 Km² (antes de la distritación de Arroyito), distribuidas en zonas urbanas y rurales¹⁰¹. Desde el año 1917 al año 2001 se crearon 22 colonias, correspondientes a 6.957 lotes y 124.391 hectáreas¹⁰². Actualmente, cuenta con una superficie de 1.386 km².

La mayor parte de la población (75%)¹⁰³ habita en el área rural y el 98% se dedica a la agricultura y ganadería. Existen asentamientos y una comunidad indígena en el distrito y los caminos de acceso a las comunidades en su mayoría son de tierra y se encuentran en mal estado, con grandes distancias para llegar a la zona urbana.

La ciudad de Horqueta fue fundada el 10 de mayo de 1793, por Juan Manuel Gamarra con ayuda del Sacerdote Andrés Salinas.¹⁰⁴

Según datos del municipio¹⁰⁵ la ciudad tuvo su origen como capilla, en el siglo XVIII, fundada oficialmente en el año 1793. Fue la primera ciudad con calle peatonal del país. La ciudad lleva el nombre de Horqueta, porque se encuentra situada en la bifurcación de caminos, de ahí deriva su nombre.

Toponimia: El nombre de la ciudad se debe a que la misma nació del cruce de caminos, llamado “Tape Horqueta”, lugar donde acampaban carretas después de largos viajes.

Los habitantes de las localidades de Paso Mbutu, Calle 15 y Domínguez Nigó, dependientes del distrito, que han participado de la consulta, han mencionado que el lugar es muy tranquilo y seguro,

⁹⁹ Disponible en: <https://www.facebook.com/224886260887864/photos/a.224886757554481/1154053567971124/>

¹⁰⁰ Distancia vial, de Asunción por la Ruta Transchaco y la Ruta 5 General Bernardino Caballero

¹⁰¹ Plan de Desarrollo Municipal Horqueta. Departamento de Concepción. 2016. Disponible en <https://www.cird.org.py/institucional/documentos/PDM%20Horqueta.pdf>

¹⁰² Rojas, L. y Areco, A. (2017). Las Colonias Campesinas en el Paraguay.

¹⁰³ MSPBS-CIRD. Plan local de Salud. Horqueta.

¹⁰⁴ Academic-esacademic.com. Disponible en: <https://esacademic.com/dic.nsf/eswiki/582747#Historia>

¹⁰⁵ Municipalidad de horqueta. Disponible en: <http://municipalidadhorqueta.gov.py/datos-de-horqueta/>

que existe unidad y solidaridad y que se conocen entre todos en la zona. Tienen una alta valoración el río y la naturaleza.

Entre las festividades del distrito han mencionado aquellas vinculadas al ámbito religioso, como fiestas patronales, procesiones y misas. Igualmente, fechas fundacionales y fechas específicas como día del niño y de la juventud. Según mencionaron en Paso Mbutú, en temporada de verano, especialmente en navidad y año nuevo el atractivo principal es la Playa. Esta es gestionada y administrada por la comisión vecinal.

Otras actividades son desarrolladas en clubes de personas con diabetes e hipertensión y de madres, organizadas por la USF.

Asimismo, torneos de fútbol femenino y masculino, laceada, carreras de caballero, vóley, llano, conocido comunitariamente como “carrera yvúrupi” (carrera a pie), actividades de la cooperativa escolar para recaudar fondos en el caso de Calle 15 y en Domínguez Nigó se mencionó entre otras actividades de recreación, la pesca en el río Aquidabán.

7.2. Datos de Población

Según datos de la DGEEC, la proyección de población del Departamento de Concepción es de 254.976, perteneciendo al Distrito de Horqueta 62.664 habitantes. Esta totalidad representa el 24,58% de la población del departamento. Horqueta está conformado por 32.477 hombres y 30.187 mujeres (Proyección 2020)¹⁰⁶. Como puede observarse en la siguiente tabla en su mayoría, es decir, el 51,83% de la población del distrito está conformada por hombres y el 48,17 % está conformada por mujeres.

Tabla 68. Proyección estimada de la población de la de Horqueta, por sexo. Año 2020

Distrito de Horqueta	Población	Porcentajes
Hombres	32.477	51,83
Mujeres	30.187	48,17
Total (ambos sexos)	62.664	100
% Población Total del Departamento	254.976	24,58

Fuente: Elaboración propia en base a datos de la DGEEC. Dpto. Concepción. Población estimada y proyectada, según distrito, sexo y grupos de edad, 2000-2025

Como se puede observar en la siguiente tabla sobre proyecciones de evolución/crecimiento de la población, la diferencia en la relación cantidad hombres/mujeres, señal que en su mayoría son hombres y se ha mantenido en los últimos 5 años.

Tabla 69. Evolución de la población de Horqueta en los últimos 5 años (2016-2020)

Distrito Horqueta	2016	2017	2018	2019	2020
Hombres	31.157	31.492	31.823	32.152	32.477
Mujeres	28.874	29.199	29.526	29.856	30.187
Población total	60.031	60.691	61.349	62.008	62.664

Fuente: DGEEC. Dpto. Concepción. Población estimada y proyectada, según distrito, sexo y grupos de edad, 2000-2025.

¹⁰⁶ DGEEC. Dpto. Concepción. Población estimada y proyectada, según distrito, sexo y grupos de edad, 2000-2025. Disponible en: <https://www.dgeec.gov.py/vt/default.php?publicacion=2>

De los datos proveídos por la DEGEEC sobre la proyección de la población del Distrito de Horqueta, se puede observar que existe una variación con los datos publicados debido a las distribuciones que fueron llevadas a cabo de manera posterior a la realización del censo. Como se puede observar en la siguiente tabla, existe una disminución de la población para el Distrito de Horqueta, aunque aumenta paulatinamente por año.

Tabla 70. Evolución de la población en los siguientes 5 años (2020-2025)

Departamento y distrito	Año					
	2020	2021	2022	2023	2024	2025
Dpto. Concepción	254.976	258.653	62.360	266.072	269.805	273.579
Horqueta	50.205	50.738	51.270	51.796	52.320	52.845

Fuente: STP/DGEEC. Paraguay. Proyección de la población por sexo y edad, según distrito, 2000-2025. Revisión 2015.

Población Indígena

Teniendo en cuenta los datos publicados por la DGEEC, en el distrito de Horqueta, existen 4 comunidades indígenas, con un total de 339 habitantes asentados en este distrito. Conformados por 162 hombres y 177 mujeres, los mismos pertenecen a 2 pueblos indígenas, Mbya Guaraní y Tavyterã/Sanapaná¹⁰⁷, se encuentran distribuidos en 75 viviendas particulares y colectivas, todos en el área rural.

Tabla 71. Distribución de la Población Indígena de Horqueta. 2012

Distrito	Comunidad, aldea o barrio y núcleo familiar	Pueblo	Cantidad de viviendas particulares y colectivas	Población		
				Total	Varones	Mujeres
Horqueta	Isla Sakã Yaka'i	Mbya Guaraní	8	33	18	15
Horqueta	Korai Punta Suerte	Mbya Guaraní	31	152	65	87
Horqueta	Ñande Yvy Pavẽ	Paĩ Tavyterã/Sanapaná	9	32	17	15
Horqueta	Paso Ita	Mbya Guaraní	27	122	62	60
Total	4	2	75	339	162	177

Fuente: DGEEC. Concepción: Población indígena por sexo y cantidad de viviendas particulares y colectivas según área, distrito, comunidad, aldea o barrio y núcleo de familia y pueblo, 2012.

Según se especifica en la tabla siguiente, de la totalidad de la población del Distrito de Horqueta, el 0,54% corresponde a la comunidad indígena, siendo en su mayoría mujeres y en menor porcentaje hombres.

¹⁰⁷ [DGEEC. Concepción: Población indígena por sexo y cantidad de viviendas particulares y colectivas según área, distrito, comunidad, aldea o barrio y núcleo de familia y pueblo, 2012.](https://www.dgeec.gov.py/default.php?publicacion=33) Disponible en: <https://www.dgeec.gov.py/default.php?publicacion=33>

Tabla 72. Población indígena de Horqueta, por sexo. Año 2012

Distrito de Horqueta	Población Indígena	Porcentajes
Hombres	162	47,49
Mujeres	177	52,21
Total (ambos sexos)	339	100
% Población del Distrito	62.664	0,54
% Población Total del Departamento	254.976	0,13

Fuente: Elaboración propia en base a datos de la DGEEC. Concepción: Población indígena por sexo y cantidad de viviendas particulares y colectivas según área, distrito, comunidad, aldea o barrio y núcleo de familia y pueblo, 2012.

Asimismo, según datos del Plan Local de Salud, el Distrito de Horqueta cuenta con 12 barrios y 101 compañías.

Hogares, vivienda

En relación a la condición de propiedad de la vivienda, según datos proveídos por la DEGEEC¹⁰⁸, en el Distrito de Horqueta, existen 8.761 viviendas particulares ocupadas precensadas, no contempla los nuevos desmembramientos que han tenido los distritos; de estas viviendas el mayor porcentaje corresponde a viviendas propias; dándose en menor proporción otras condiciones de propiedad como prestado o cuidan, pagando en cuotas, alquilada, ocupada de hecho y en condominio. Los datos en porcentajes se observan en la siguiente tabla.

Tabla 73. Condición de propiedad de la vivienda

Condición de propiedad de la vivienda	Departamento de Concepción	Distrito de Horqueta
Viviendas particulares ocupadas con personas presentes	42.402	8.761
% Es propia	85,2	88,8
% La están pagando en cuotas	0,9	1,7
% Es en condominio	0,4	0,6
% Es alquilada	5,1	1,6
% Es prestada, la cuidan	7,5	5,9
% Es ocupada de hecho	0,8	1,3
% No informado	0,1	0,1

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012.

Necesidades Básicas Insatisfechas (NBI)

En relación a Necesidades Básicas Insatisfechas (NBI)¹⁰⁹ en el Distrito de Horqueta, según datos otorgados por la DGEEC¹¹⁰ en relación a la situación tanto a nivel país como del departamento, reflejan que; el 58,2% de los hogares del mismo distrito cuentan con al menos una NBI; el 31,3% de hogares con NBI en infraestructura sanitaria; el 21,0% de los Hogares con NBI en capacidad de

¹⁰⁸ Datos solicitados y proveídos por la DGEEC. Sep. 2020.

¹⁰⁹ DGEEC. Necesidades Básicas Insatisfechas (NBI) 2012 PARAGUAY. Disponible en: <https://www.dgeec.gov.py/Publicaciones/Biblioteca/investigacion%20tematica/Triptico-de-necesidades-insatisfechas-NBI-2012.pdf>

¹¹⁰ Datos solicitados y proveídos por la DGEEC, Sep. 2020.

subsistencia; el 19,5% de los Hogares con NBI en acceso a la educación y el 18,0% de los hogares con NBI en calidad de la vivienda, como puede observarse en la siguiente tabla.

Tabla 74. Hogares con NBI, según departamento y distrito

Indicadores de Necesidades Básicas Insatisfechas (NBI) (%)	Total hogares	Departamento de Concepción	Distrito de Horqueta
Hogares particulares ocupados con personas presentes	1.232.496	42.638	8.772
% Hogares con al menos una NBI	43,0	56,2	58,2
% Hogares con NBI en calidad de la vivienda	12,6	19,0	18,0
% Hogares con NBI en infraestructura sanitaria	20,8	29,7	31,3
% Hogares con NBI en acceso a la educación	15,7	20,3	19,5
% Hogares con NBI en capacidad de subsistencia	14,9	19,8	21,0

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012 y Tríptico Necesidades Básicas Insatisfechas (NBI) 2012. Paraguay en base a STP-DGEEC. Censo Nacional de Población y Viviendas 2012.

7.3. Economía

Según datos expuestos en el Plan Local del Distrito de Horqueta, la economía de este distrito se basa preponderantemente en la agricultura y comercios e industrias. Sus habitantes se dedican a actividades como la plantación de ka'a he'ê, algodón, tártago, poroto, mandioca, maíz, entre otros. Se observa explotación forestal y trabajo en aserraderos, curtiembres, aceiteras, desmontadoras de algodón y productos del agro¹¹¹.

Según los datos proveídos por la DEGEEC, el Sector Económico de la población ocupada es la Población ocupada de 12 años y más de edad que pertenece a una rama de actividad específica, donde el sector primario comprende a la agricultura, ganadería, caza y pesca; el sector secundario abarca las industrias manufactureras, construcción, minas y canteras; el sector terciario agrupa a electricidad, gas y agua, comercio, restaurantes y hoteles, transporte, almacenamiento y comunicaciones, finanzas, seguros, inmuebles, servicios comunales, sociales y personales; y no informado¹¹².

Actividades económicas

Según datos proveídos por la DGEEC, en el Distrito de Horqueta predominan las actividades económicas relacionadas al sector primario con 53,5%, seguidamente la del sector terciario con el 34,7% y finalmente con menor porcentaje el sector secundario con 11,3%, como se puede observar en la siguiente tabla.

Tabla 75. Población ocupada por sector económico

Datos de Población	Departamento de Concepción	Distrito de Horqueta
Sector económico de la población ocupada	226.585	46.029
% Primario	40,9	53,5
% Secundario	15,7	11,3

¹¹¹ Plan Local de Salud de Horqueta. Departamento de Concepción. 2016. Disponible en https://www.cird.org.py/institucional/documentos/Plan_Local_Salud_Horqueta.pdf

¹¹² Datos solicitados y proveídos por la DGEEC. Sep. 2020.

Datos de Población	Departamento de Concepción	de Distrito de Horqueta
% Terciario	42,2	34,7
% No informado	1,2	0,6

Fuente: STP/DGEEC. *Censo Nacional de Población y Viviendas, 2012.*

Las personas consultadas de las localidades han señalado que las actividades principales en torno a la economía están centradas en la ganadería, pequeña ganadería y todas las actividades relacionadas a estas por las estancias que están ubicadas en la zona. La modalidad es por jornal o por trato/trabajo (una persona contratada por la empresa/estancia subcontrata personales por un tiempo determinado).

Asimismo, indicaron como actividad productiva, la pesca y el trabajo artesanal en la elaboración de sombreros, redes de pesca y tarrafa a través del comité de producción.

Además, de los pequeños comercios en la comunidad (despensas, copetines, mecánico).

En la Localidad de Calle 15, los pobladores mencionaron como principal actividad económica a la agricultura, cuentan con plantaciones de sésamo, feijao, sandía y piña, para consumo y venta. *Se habían dedicado a la plantación de eucalipto, pero no prosperó.* Otra de las actividades es el trabajo a través de la pequeña ganadería.

En la localidad de Dominguez Nigó, según los habitantes que participaron de la consulta, la actividad económica principal es la producción y venta de sombreros de caranday, se pueden dar tres formas de trabajo con relación a esta, de manera individual, por asociación o trabajando para un patrón. Generalmente el mercado de salida es Pedro Juan Caballero. Otra opción es la albañilería, el trabajo en las estancias, ya sea de capataz o jornalero, pero no es frecuente.

Y la chacra es utilizada para autoconsumo; plantan mandioca, maní y caña de azúcar. La pequeña ganadería y el tambo son opciones para el permute de artículos en las despensas y pequeños comercios.

Otros pobladores se desempeñan como funcionarios públicos en las escuelas y colegios, registro civil, USF y Policía nacional.



Puesto de venta de combustible-Paso Mbutu



Producción de sombreros de Karanda'y -Paso Mbutu



Producción de Carbón-Calle 15



Taller de Moto-Paso Mbutu

Fuente: Registro fotográfico de trabajo de campo. Equipo consultor. Concepción. Agosto -septiembre 2020

7.4. Acceso a servicios

Acceso a servicios básicos

Referente al acceso a servicios básicos en el Distrito de Horqueta, los datos proveídos por la DGEEC reflejan que el 93,0% de las viviendas cuenta con energía eléctrica; el 72% cuenta con agua corriente; el 34,8% de viviendas con saneamientos mejorados; el 10,5% con servicio de recolección de basura y ninguna de las viviendas accede al desagüe cloacal en el distrito, como se puede observar en la siguiente tabla:

Tabla 76. Viviendas con Acceso a Servicios Básicos

Datos de viviendas particulares Servicios básicos	Departamento de Concepción	Distrito de Horqueta
Viviendas particulares ocupadas con personas presentes	42.402	8.761
% Viviendas con energía eléctrica	93,1	93,0
% Viviendas con agua corriente ¹¹³	74,4	72,0
% Viviendas con desagüe cloacal ¹¹⁴	6,3	-
% Viviendas con recolección de basura	22,8	10,5
% Viviendas con saneamiento mejorado	46,9	34,8

Fuente: STP/DGEEC. *Censo Nacional de Población y Viviendas, 2012.*

En cuanto a la disposición de residuos sólidos, el Plan Local de Salud de Horqueta señala que el distrito cuenta con un vertedero municipal para la disposición y el tratamiento de las basuras; sin embargo, sólo una parte de la zona urbana accede al servicio de recolección, en la zona rural los medios de eliminación de residuos practicados comúnmente por la población son la quema y el entierro.

Esto pudo confirmarse durante el trabajo de campo, ya que los pobladores involucrados respondieron que no se cuenta con el servicio y que se procede a la quema o al entierro en hoyos. Igualmente, se confirmó que el uso de letrinas en la zona es aún mayoritario como también se afirma en el Plan Local de Salud, en el que se señala que sólo el 16 % de la población en la zona urbana de Horqueta cuenta con baños modernos, mientras que, en mayor proporción, el 72 % correspondiente a la zona rural utilizan letrinas sanitarias.

En cuanto al acceso al agua potable, las tres localidades consultadas tienen distintas formas de acceso.

En la localidad de Paso Mbutu, los habitantes señalaron que no cuentan con agua potable y corriente. La gran mayoría de la comunidad utiliza el agua de pozo para el riego y lavado de cubiertos ya que sale salada y para el consumo traen de una naciente, a la que denominan chorro o yvu, otra alternativa es acumular el agua de lluvia en bidones 100 o 200 litros; o pagar 20 mil por bidón para abastecimiento.

En la localidad de Calle 15, las personas han dicho que el acceso es a través de pozos particulares, en algunos casos comparten. Existen familias que usan el agua de tajarar diariamente.

¹¹³ Incluye: ESSAP, SENASA, red comunitaria, red privada, y pozo artesiano, con cañería fuera de la vivienda, pero dentro del terreno o con cañería hasta la cocina y/o baño.

¹¹⁴ Incluye: Desagüe por red pública, pozo ciego con y sin cámara séptica.



Tajamar- Calle 15. Fuente: Registro fotográfico de trabajo de campo. Equipo consultor. Concepción. Agosto -septiembre 2020.

Y, en la localidad de Domínguez Nigó indicaron que acceden al agua a través de un pozo artesiano gestionado a través de la Gobernación. El agua es tratada con cloro y la gran mayoría de las familias accede a ella.

Ninguna de las comunidades consultadas accede a la red desagüe cloacal.



*Disposición final de Residuos- Calle 15
Fuente: Registro fotográfico de trabajo de campo. Equipo consultor.
Concepción. Agosto -Septiembre 2020.*

En relación al uso de Pozo séptico/Letrina/Otro, en las comunidades más de la mitad de la población aun utiliza letrina.

Con respecto al tratamiento de la basura han mencionado que ninguna de las localidades cuenta con servicios de recolección de basuras, estas son quemadas o tiradas en hoyos, confirmando así los datos mencionados por la DGEEC/STP del censo 2012.

Según los datos publicados en el Plan de Desarrollo Municipal de Horqueta, el acceso a energía eléctrica es suministrado por la Sub Estática de Costa Romero ubicada a 3km de Horqueta y procesa la energía de la Central Hidroeléctrica de Itaipú, aunque de las localidades de Horqueta involucradas a la consulta, los pobladores han indicado que la totalidad de la población cuenta con energía eléctrica a través de la ANDE.

Educación

En relación a la educación en el Distrito de Horqueta, según los datos del Ministerio de Educación y Ciencias (MEC)¹¹⁵ y la Guía Completa de Educación en Paraguay¹¹⁶, se encuentran 86 establecimientos educativos, de los cuales 17 se encuentran en el área urbana y 69 en el área rural. De la totalidad, 40 instituciones con modalidad de Educación Inicial (32 en el área rural y 8 en el área urbana); 83 instituciones con modalidad de Educación Escolar Básica (11 en el área urbana y 72 en el área rural); 20 instituciones con modalidad de Educación Media (3 en el área urbana y 17 en el área rural). Así mismo se pueden ver en la siguiente tabla.

Tabla 77. Nivel educativo según zona de ubicación

Nivel educativo	Total	Zona	
		Urbana	Rural
Distrito Horqueta			
Educación inicial	40	8	32
Escolar Básica	83	11	72
Educación media	20	3	17
Total	143	22	121

Fuente: elaboración en base a los datos del MEC- Datos abiertos, Establecimientos escolares 2019 y la Guía Completa de Educación en Paraguay.



Escuela y Colegio Edelmira Torres Blanco - Paso Mbutu.



Escuela Básica 2460 Niño Milagroso- Calle 15

Fuente: Registro fotográfico de trabajo de campo. Equipo consultor. Concepción. Agosto -Septiembre 2020.

Asimismo, según datos del MEC¹¹⁷, existen 3 instituciones con modalidad de Formación Profesional de Educación Permanente para jóvenes y adultos, las 3 se encuentran ubicadas en el área urbana y 1 institución con Modalidad de Educación Especial también en el área urbana (formación integral de personas con necesidades educativas diferentes, en el área urbana).

¹¹⁵ MEC. Disponible en: https://datos.mec.gov.py/data/establecimientos_escolares_priorizados_elegibles_fonacide

¹¹⁶ Disponible en: <https://guia-concepcion.educacionenparaguay.com/>

¹¹⁷ MEC. Disponible en: https://datos.mec.gov.py/data/establecimientos_escolares_priorizados_elegibles_fonacide

Es importante aclarar que existen establecimientos que tienen más de una institución y que en las instituciones podrían impartirse más de una modalidad.

A continuación, se presenta cada institución educativa y sus características:

Tabla 78. Instituciones educativas del Distrito de Horqueta por zona, modalidad y acceso a servicios básicos

Instituciones Educativas Distrito de Horqueta	Localidad/Barrío	Zona	Nombre de asentamiento	Nombre Comunidad Indígena	Nivel educativo	Agua	Energía
Escuela Básica N° 519 Zapadores del Chaco	Horqueta	Urbana	-	-	E.E.B. y E.I.	SENASA	ANDE
Escuela Básica N° 2067 Padre José Venancio Ortellado	Horqueta	Urbana	-	-	E.I. y E.E.B.	SENASA	ANDE
Escuela Básica N° 4952 San Roque G. de Sta. Cruz.	Horqueta	Urbana	-	-	E.E.B.	SENASA	ANDE
Escuela Básica N° 7597 Juan Pablo II	Horqueta	Urbana	-	-	E.I. y E.E.B.	SENASA	ANDE
Escuela Básica N° 6922 Prof. Ruperta Giménez de González.	Horqueta	Urbana	-	-	E.E.B.	SENASA	ANDE
4 instituciones: Esc. Básica N° 28 Próceres de Mayo, Col. Nac. Próceres de Mayo, Col. Nac. San Roque G. de Santa Cruz y Centro de Educ. PPJA N° 37	Barrio Las Palmas	Urbana	-	-	E.I., E.E.B. y PPJA	SENASA	ANDE
Colegio Nacional Jorge Sebastián Miranda	Barrio Las Palmas	Urbana	-	-	E.M.	SENASA	ANDE
Escuela Básica N° 1076 Priv. Sub. Sagrado Corazón de Jesús	Barrio Las Palmas	Urbana	-	-	E.I. y E.E.B.		
Centro N 1-49 Humberto Ramón Morales	Barrio Las Palmas	Urbana	-	-	E.I., E.E.B. y E.M. y PPJA	SENASA	ANDE
Colegio Parroquial Priv. Sub. Alejo García y Centro 1 - 8 Manuel Ortiz Guerrero	Casco Urbano	Urbana	-	-	EEB, EM y PPJA	-	-
Centro de Educación Integral Mborayhu Pavé	Barrio Inmaculada	Urbana	-	-	E.E.	-	-
Escuela Básica N° 1077 Priv. Sub. La Inmaculada	Barrio Inmaculada	Urbana	-	-	E.I. y E.E.B.	-	-
Esc. Básica N° 6659 CEINOR	Peguajho San Francisco	Urbana	-	-	E.I. y E.E.B.	SENASA	ANDE
Escuela Básica N° 4337 San Isidro - Sede Tutorial EMA	Laguna 7 - Gral. Bernardino Caballero	Rural	-	-	E.M.	Pozo Artesiano	ANDE
Escuela Básica N° 4344 Gral. Bernardino Caballero	Calle 8 Zona Sur	Rural	-	-	E.I. y E.E.B.	Pozo Artesiano	ANDE

Instituciones Educativas Distrito de Horqueta	Localidad/B arrio	Zona	Nombre de asentamiento	Nombre Comunidad Indígena	Nivel educativo	Agua	Energía
Aulas Extensivas Nueva Esperanza	Asentamiento Nueva Esperanza	Rural	-	-	E.E.B.	SENASA	ANDE
Escuela Básica N° 7173 Santa Ana	Kurupa`y Loma	Rural	Asentamiento Kurupa`y Loma	-	E.E.B.	Pozo Artesiano	ANDE
Escuela Básica N° 593 y Col. Nac. Capitán Gumersindo Sosa.	Capitán Sosa	Rural		-	E.I., E.E.B. y E.M.	SENASA	ANDE
Escuela Básica N° 2667 y Col. Nac. Divino Niño Jesús	Horqueta Km.37	Rural		-	E.E.B.	SENASA	ANDE
Escuela Básica N° 4357 Hno. José Luis Arbues Rubiol	Colonia Juan Manuel Frutos	Rural	Colonia Juan Manuel Frutos	-	E.I. y E.E.B.	Pozo Artesiano	ANDE
Escuela Básica N° 2666 y Colegio Nacional San Sebastián	Peguajho Guasu	Rural		-	EEB y EM	SENASA	ANDE
Escuela Básica N° 1703 San Ignacio de Loyola y Colegio Nacional San Ignacio	B° San Ignacio	Rural	Colonia Ex - Combatiente	-	E.I., E.E.B.	Pozo Artesiano	ANDE
Escuela Básica N° 2100 San Marcos	Km 31	Rural	-	-	E.E.B.	SENASA	ANDE
Escuela Básica N° 2069 y Col. Nac. San Blas.	Peguajho Loma San Blas	Rural	-	-	E.I. y E.E.B. y E.M.	SENASA	ANDE
Escuela Básica N° 4339 Paz del Chaco	Santo Domingo	Rural	-	-	E.I. y E.E.B.	SENASA	ANDE
Escuela Básica N° 4342 Dr. José Gaspar R. de Francia y Col. Nac. Capitán Giménez.	Capitan Gimenez	Rural	Colonia José Berges	-	E.I. E.E.B.	Pozo Artesiano	ANDE
Colegio Nacional Gral. Bernardino Caballero y Escuela Básica N° 1718 Gral. Bernardino Caballero	Santa Librada	Rural	-	-	E.I., E.E.B. y E.M.	SENASA	ANDE
Escuela Básica N° 1713 San Luis Gonzaga Colegio Nacional San Luis Gonzaga	Costa Romero	Rural	Colonia José Berges	-	E.I., E.E.B.	Pozo Artesiano	ANDE
Escuela Básica N° 513 y Col. Nac. Mcal. José F. Estigarribia.	Naranjaty`i	Rural	-	-	E.M. y E.E.B	SENASA	ANDE
Escuela Básica N° 7061 Virgen de Fátima	Horqueta	Rural	-	-	E.E.B	SENASA	ANDE
Escuela Básica N° 2073 San Miguel	San Miguel	Rural	-	-	E.E.B.	SENASA	ANDE
Escuela Básica N° 1712 Fulgencio Yegros y Colegio Nacional de Alfonso Cue	Alfonso Cué	Rural	-	-	EI, EEB E.E.B.	SENASA	ANDE

Instituciones Educativas Distrito de Horqueta	Localidad/B arrio	Zona	Nombre de asentamiento	Nombre Comunidad Indígena	Nivel educativo	Agua	Energía
Escuela Básica N° 4347 San Roque G. de Santa Cruz y Colegio Nacional San Roque G. de Santa Cruz	Calle 11	Rural	Asentamiento Alemán Cué	-	E.I. y E.E.B. y E.M.	Pozo Artesiano	ANDE
Escuela Básica N° 1709 y Col. Nac. Don Carlos A. López	25 de Abril	Rural	-	-	E.I. y E.E.B.	Pozo Común	ANDE
Escuela Básica N° 1974 y Col. Nac. Roque Bogado	Pirity	Rural	-	-	E.M. y E.E.B.	Privado	ANDE
Escuela Básica N° 2580 y Col. Nac. San Felipe.	San Felipe. Santa Librada	Rural	-	-	E.I. y E.E.B. y E.M.	SENASA	ANDE
Escuela Básica N° 1706 Héroes del Chaco.	Cerrito Naranjaty	Rural	-	-	E.E.B.	SENASA	ANDE
Escuela Básica N° 2459 Edelmira Torres Blanco y Colegio Nacional Edelmira Torres Blanco	Paso Mbutú	Rural	-	-	E.E.B. y E.M.	Pozo Artesiano	ANDE
Escuela Básica N° 4349 Perpetuo Socorro y Colegio Nacional Perpetuo Socorro	Calle 9	Rural	Asentamiento Alemán Cué	-	E.I., E.E.B. y E.M.	Pozo Artesiano	ANDE
Escuela Básica N° 2579 San Estanislao	Santani.	Rural	-	-	E.E.B.	SENASA	ANDE
Escuela Básica N° 7862 San Juan	Kurupa`y Loma	Rural	Asentamiento Kurupa`y Loma	-	E.E.B.	Pozo Común	ANDE
Escuela Básica N° 6647 Mcal. Francisco Solano López	Callejon Santa Rosa	Rural	-	-	E.I. y E.E.B.	SENASA	ANDE
Escuela Básica N° 2072 San Juan Evangelista	Peguajho Typy	Rural	-	-	E.E.B.	SENASA	ANDE
Escuela Básica N° 4947 Priv. Sub. Virgen de Caacupe	Calle 9 - Alemán Cué	Rural	Asentamiento Alemán Cué	-	E.I. y E.E.B.	Pozo Artesiano	ANDE
Escuela Básica N° 6550 María Auxiliadora	Kurupa`y Loma	Rural	Asentamiento Kurupa`y Loma	-	E.E.B.	Pozo Artesiano	ANDE
Escuela Básica N° 7158 Eligio Ayala	Kurupa`y Loma	Rural	Asentamiento Kurupa`y Loma	-	E.E.B.	SENASA	ANDE
Escuela Básica N° 2578 Gral. Bernardino Caballero	Laguna Siete	Rural	-	-	E.E.B.	SENASA	ANDE
Escuela Básica N° 593 Capitán Gumersindo Sosa.	Capitán Sosa	Rural	-	-	E.I., E.E.B. y E.M.	SENASA	ANDE
Escuela Básica N° 3564 Héroes del Chaco y Colegio Nacional Héroes del Chaco	Cepingo Cañada	Rural	-	-	E.E.B. y E.M.	Pozo Artesiano	ANDE

Instituciones Educativas Distrito de Horqueta	Localidad/B arrio	Zona	Nombre de asentamiento	Nombre Comunidad Indígena	Nivel educativo	Agua	Energía
Escuela Básica N° 4345 Dr. José Gaspar Rodríguez de Francia	Tupãrenda	Rural	Colonia Juan Manuel Frutos	-	E.I. y E.E.B.	Pozo Artesiano	ANDE
Escuela Básica N° 2071 y Col. Nac. Dr. Eligio Ayala.	Costa Clavel	Rural	-	-	E.M. y E.E.B	SENASA	ANDE
Escuela Básica N° 4356 San Lorenzo y Col. Nac. San Lorenzo Mártir.	Brasil Cue	Rural	-	-	EEB y EM.	SENASA	ANDE
Escuela Básica N° 2068 San Roque G. de Sta. Cruz.	Salinas Cué	Rural	-	-	E.E.B	SENASA	ANDE
Escuela Básica N° 4334 Don Carlos Antonio López.	Egua	Rural	-	-	E.E.B	Pozo Artesiano	ANDE
Escuela Básica N° 4358 Niños Mártires de Acosta Ñu.	Peguajho San Francisco	Rural	-	-	E.I. y E.E.B.	SENASA	ANDE
Colegio Nacional Gral. Marcial Samaniego	Naranjaty	Rural	-	-	E.E.B. y E.M.	SENASA	ANDE
Escuela Básica N° 4953 1° de Mayo	Capitán Giménez - Zona Sur	Rural	-	-	E.E.B.	SENASA	ANDE
Escuela Básica N° 8044 Takuapu Pora	Jeguahaty	Rural	-	Jeguahaty	E.E.B.	Tajamar	Panel Solar
Escuela Básica N° 15194 Paso Ita	Vy`a Renda - Boquerón	Rural	-	Vy`a Renda	E.E.B.	Pozo Artesiano	ANDE
Escuela Básica N° 7075 Santa Teresita	Peguajho	Rural	-	-	E.E.B.	SENASA	ANDE
Escuela Básica N° 7598 José Domingo Jara	Asentamiento la Amistad.	Rural	-	-	E.I. Y E.E.B.	SENASA	ANDE
Escuela Básica N° 1707 Emiliano R. Fernández	Ycua Jhovv	Rural	-	-	E.I. Y E.E.B.	SENASA	ANDE
Escuela Básica N°2577 Independencia Nacional	Naranjaty	Rural	-	-	E.E.B.	-	-
Escuela Básica N° 1714 Juan Carlos García	Belén Cue	Rural	-	-	E.E.B.	-	-
Escuela Básica N°2576 Prof. Carmen Joaquina M. de López	Ybyraty	Rural	-	-	E.E.B.	-	-
Escuela Básica N°1710 José Berges	Naranjaty	Rural	-	-	E.I. y E.E.B.	-	-
Escuela Básica N° 3834 República del Paraguay	San Roque. Cap. Sosa	Rural	-	-	E.E.B.	SENASA	ANDE
Escuela Básica N° 4346 Gral. Elizardo Aquino	Santo Domingo	Rural	-	-	E.I. y E.E.B.	-	-
Escuela Básica N° 7347 San José Obrero	San José	Rural	-	-	E.E.B.	-	-

Instituciones Educativas Distrito de Horqueta	Localidad/B arrio	Zona	Nombre de asentamiento	Nombre Comunidad Indígena	Nivel educativo	Agua	Energía
Esc. Básica N° 4888 Virgen del Carmen	Toldo Cué - Calle 7	Rural	-	-	E.E.B.	Pozo Artesian o	ANDE
Escuela Básica N° 6990 Mons. Aníbal Maricevich	Colonia Oro Verde	Rural	-	-	E.I. y E.E.B.	Pozo Artesian o	ANDE
Escuela Básica N° 4343 Dr. Raúl Peña y Colegio Nacional Dr. Raúl Peña	Alfonso Cué - Calle 10	Rural	-	-	E.I. y E.E.B. y E.M.	Pozo Artesian o	ANDE
Escuela Básica N° 4348 San Jorge	San Jorge	Rural	Colonia San Jorge		E.I. y E.E.B.	Pozo Artesian o	ANDE
Escuela Básica N° 1708 Gral. José Eduvigis Díaz	Cuartelero	Rural	-	-	E.E.B.	Pozo Común	ANDE
Escuela Básica N°4338 Santa Lucía	Paso Ata	Rural	-	-	E.E.B.	SENASA	ANDE
Escuela Básica N°4340 Prof. German Bazán	Santa Librada	Rural	-	-	E.I. y E.E.B.		
Escuela Básica N° 1711 Ntra. Sra. De la Asunción	Espagin	Rural	-	-	E.I. y E.E.B.	SENASA	ANDE
Escuela Básica N° 2581 Niños Mártires de Acosta Ñu.	San Antonio	Rural	-	-	E.I. y E.E.B.	Pozo Artesian o	ANDE
Escuela Básica N° 2070 San Juan Bosco	Ycua Pora	Rural	-	-	E.E.B.	SENASA	ANDE
Escuela Básica N° 2668 Ntra. Sra. Del Rosario	Santo Domingo	Rural	-	-	E.E.B.	-	-
Escuela Básica N° 4351 Héroes del Chaco	Totora	Rural	-	-	E.E.B.	-	-
Escuela Básica N° 1705 Niños Héroes de Acosta Ñu	Jhugua Po'í	Rural	-	-	E.E.B.	-	-
Escuela Básica N° 4598 El Paraguayo Independiente	Espagin	Rural	-	-	E.I. y E.E.B.	-	-
Escuela Básica N° 1716 Mcal. José Félix Estigarribia	Toldo Cué	Rural	-	-	E.I. y E.E.B.	-	-
Escuela Básica N° 6991 Prof. Dr. Luis María Argaña	Calle 11	Rural	-	-	E.E.B.	-	-
Escuela Básica N° 2462 Mcal. José Félix Estigarribia y Colegio Nacional Choferes del Chaco	Colonia Choferes del Chaco- Fisco	Rural	-	-	E.I. y E.E.B.	-	-

Fuente: elaboración en base a los datos del MEC- Datos abiertos, Establecimientos escolares 2019 y la Guía Completa de Educación en Paraguay.

Con respecto a la educación superior, en el distrito de Horqueta existen varias instituciones universitarias, públicas y privadas, como se indica en el informe de estudios sociales del componente industrial, entre ellas figuran, Universidad Tecnológica Intercontinental (UTIC), Universidad San

Carlos, Universidad Nacional de Concepción (UNC), la Universidad Politécnica y Artística del Paraguay (UPAP). Asimismo, el Instituto de Formación Docente de Horqueta (IFD Horqueta).

Se identifica una variedad de carreras de grado y posgrado ofrecidas por estas instituciones, entre ellas se destacan las carreras relacionadas a la Agronomía, Ciencias de la Educación, Administración, Contabilidad, Informática, entre otras vinculadas a la salud, como Medicina, Enfermería, Nutrición y otros.

Formación profesional y técnica

En lo que refiere al acceso a la formación profesional y técnica, dentro del Departamento de Concepción se observan varias ofertas de enseñanza en instituciones públicas y privadas. Según los datos extraídos de la página oficial de SINAFOCAL, en el distrito de Horqueta está planificado impartir cursos de “Cocina y Repostería”.

Se presentan a continuación otras ofertas de formación profesional y técnica que existen en el distrito de Horqueta.

Tabla 79. Educación técnica

Institutos	Distritos	Carreras
ITN Instituto Tecnológico del Norte	Horqueta	Auxiliar de informática Secretariado Ejecutivo Técnico en informática Programación Cajero comercial Cajero bancario Inglés americano

Fuente: Información complementaria en el marco de los estudios sociales (Componente Industrial-Pág.18)

Salud



USF Paso Mbutu- Fuente: Registro fotográfico de trabajo de campo. Equipo consultor. Concepción. Agosto -septiembre 2020

Con respecto a los servicios de salud, según los datos del Ministerio de Salud Pública y Bienestar Social (MSPYBS), en el Distrito de Horqueta existe; 1 Hospital Distrital y 11 Unidades de Salud de la Familia. Los siguientes centros asistenciales son:

- Hospital Distrital de Horqueta
- USF- Santa Librada
- USF- Paso Mbutú
- USF- Naranjaty
- USF- Peguajhó Loma
- USF- Capitán Giménez
- USF- Alfonso Cué
- USF- Capitán Sosa
- USF- Curupa'y Loma
- USF- Alemán Cué
- USF- Ybyraty-Brasil Cué
- USF- Totora

En el Plan Local de Salud se menciona que en la Localidad de Horqueta y sus alrededores se cuenta con 7 Puestos de Salud:

- Puesto de Salud Capitán Sosa
- Puesto de Salud Pirity San Carlos
- Puesto de Salud Arroyito Núcleo 7
- Puesto de Salud Calle 13 San Ignacio
- Puesto de Salud Cuartelero
- Puesto de Salud Paso Mbutu
- Puesto de Salud Ykua Hovy



Puesto de Salud Cuartelero -Fuente: Registro fotográfico de trabajo de campo. Equipo consultor. Concepción. Agosto -Septiembre 2020.

Según datos proveídos por la Primera Región Sanitaria, en el año 2018 existían 76 establecimientos de salud en todo el departamento de Concepción, de los cuales 15 se encuentran en el distrito de Horqueta (servicios públicos confirmar) y 1 clínica privada (San Antonio).

Según datos brindados por los pobladores de las localidades visitadas en el marco del trabajo de campo, se confirmó que hay 1 USF en Paso Mbutu (1 Doctor, 1 Lic. En Enfermería, 2 Técnico Superior en Enfermería y 1 Agente Comunitario). Programas de Vacunación, PANI, Planificación y papa Nicolau, Control prenatal, Control crecimiento y desarrollo, Prevención Its, Hipertensión y diabetes, Tuberculosis y otras. Las problemáticas más frecuentes de salud son la hipertensión y parasitosis por el uso de letrina y el uso del agua que no es agua potable.

Los pobladores de Calle 15 consultan en esta USF porque queda a una distancia de 8km y si no se encuentra el doctor acuden al Puesto de Salud de Arroyito a 12 km. Los habitantes de Domínguez Nigó consultan en el Puesto de Salud de Cuartelero, les queda a una distancia de 10 km, cuentan con

un médico de familia y 4 licenciadas. Realizan visitas, desarrollan charlas educativas a los alumnos y reuniones con el grupo de mujeres.

Para los casos graves acuden a Horqueta o Concepción (distancia a Horqueta: 40 km de la ruta y Concepción: 80km).

Acceso a Tecnologías de información y medios de comunicación (TIC) y bienes de confort

Atendiendo a los datos facilitados por la DGEEC, con relación al acceso a TICs, puede señalarse que la gran mayoría de las viviendas en el distrito cuentan con teléfono celular, seguidamente de radio y televisor; en menor proporción las viviendas poseen TV cable, computadoras, antenas parabólicas, computadoras conectadas a internet y teléfono fijo, como puede observarse en la siguiente tabla.

Tabla 80. Equipos domésticos y TIC

Acceso a TIC	Departamento de Concepción	Distrito de Horqueta
Viviendas particulares ocupadas con personas presentes	42.402	8.761
% Viviendas con radio	80,6	76,9
% Viviendas con televisor	79,8	75,4
% Viviendas con teléfono fijo	8,0	5,2
% Viviendas con teléfono celular	83,3	83,7
% Viviendas con computadora	11,9	7,7
% Viviendas con computadora conectada a internet	9,2	5,3
% Viviendas con antena parabólica	10,8	6,3
% Viviendas con TV cable	13,4	15,7

Fuente: STP/DGEEC. Censo Nacional de Población y Viviendas, 2012.

Los habitantes de las localidades consultadas (Paso Mbutu, Calle 15 y Domínguez Nigó) han indicado que los medios de comunicación más utilizados son: radio, televisión, celulares y redes sociales; de los cuales mencionaron como emisoras radiales a Radio Arroyito Récord 96.5, Radio Cristal y la 102.5 de Arroyito; Guyra Campana 102.5 y la 89.9 de Horqueta; Radio Los ángeles y Radio Regional; a canales de televisión: Canal 9 SNT, Telefuturo y canales por cable y Celulares con internet: a través de mensajería, llamadas y grupos de whatsapp (mencionaron que en la zona hay mala conexión a internet).

Así mismo, la DGEEC proporcionó información con relación al acceso de la población del Distrito de Horqueta a los bienes de confort en las viviendas, estos datos señalan que gran porcentaje de las viviendas cuentan con motocicletas, seguidamente cuentan con heladeras y lavarropas, luego en menor porcentaje las viviendas poseen ducha eléctrica, video/DVD, aire acondicionado, automóvil/camioneta, horno microondas y termocalefón, como se puede observar en la siguiente tabla.

Tabla 81. Equipos domésticos y Bienes de confort

Bienes de confort	Departamento de Concepción	Distrito de Horqueta
Viviendas particulares ocupadas con personas presentes	42.402	8.761
% Viviendas con heladera	68,1	62,2
% Viviendas con lavarropas	50,9	44,5
% Viviendas con video/DVD	21,2	16,1
% Viviendas con termocalefón	4,0	3,7
% Viviendas con ducha eléctrica	25,7	19,9
% Viviendas con acondicionador de aire	15,2	8,8
% Viviendas con horno microondas	14,4	7,4
% Viviendas con automóvil/camioneta	9,9	8,5
% Viviendas con moto	74,3	72,3

Fuente:

STP/DGEEC. Censo Nacional de Población y Viviendas, 2012.

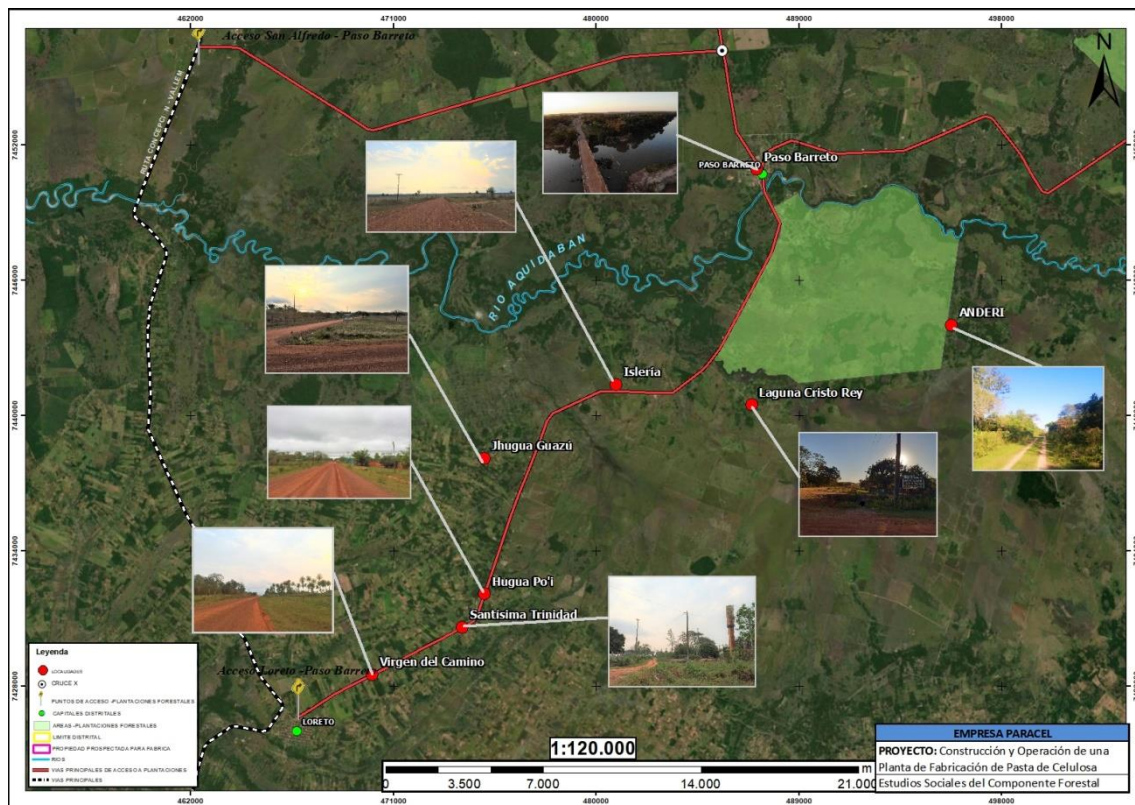
ANEXO 4: FICHAS DE COMUNIDADES IDENTIFICADAS

El presente anexo contiene datos proporcionados por referentes del nivel local durante el proceso de consulta. Estos elementos han sido sistematizados en formato de fichas teniendo en cuenta variables socioeconómicas, culturales e históricas; a fin de visualizar un perfil específico de las comunidades de estudio.

Con miras a la caracterización del territorio se detalla información correspondiente a un total de 16 comunidades. Las mismas fueron identificadas a partir de los accesos principales¹y/o la cercanía a los campos forestales prospectados, que se encuentran localizados en los departamentos de Concepción y Amambay.

A continuación se presentan las comunidades de estudio. Cabe señalar que el orden establecido se definió en función a los accesos principales.

Mapa Acceso Loreto-Paso Barreto



A partir de esta vía se encuentran las comunidades de: Virgen del Camino, Santísima Trinidad, Huguá Po'i, Jhuguá Guazú, Islería, Laguna Cristo Rey, Anderi y Paso Barreto.

1 Ver Mapa- Principales vías de acceso vinculadas al proyecto- Estudios Sociales Componente Forestal 2020.



Virgen del Camino



Información general

Zona: Rural

Distancia del centro urbano: A unos 26 km de la ciudad de Concepción (Loreto-Paso Barreto)

Municipio del cual depende: Loreto

División del territorio: Virgen del Camino

Límites: Santísima Trinidad, Huguá Po'i, Loreto, Torales San Roque, Laguna Mobohapy, Caacupemí

Principales vías de acceso: Ruta Loreto - Paso Barreto.

Habitantes: 281 personas

Cantidad de familias/viviendas: Alrededor de 100 familias y 75 viviendas

Comunidades indígenas: No hay comunidades indígenas en la zona.



Aspectos históricos

Se la conoce como Virgen del Camino en honor a la Santa Patrona de la comunidad. Empezó a poblarse desde hace más de 60 años. En sus inicios había aproximadamente unas 30 familias; instaladas principalmente en la zona más próxima a la localidad de Santísima Trinidad.

Los primeros pobladores eran oriundos de las localidades de Ykua Porã, Cañada la Paz, Jhugua Bonete y Ciudad del Este; siendo los Guerrero, Guerrero Vázquez y Cristaldo parte de las primeras familias en asentarse en la zona.

Actualmente el territorio se extiende desde la casa de don Apolonio Rojas hasta la casa de la familia Guerrero.

Entre los aspectos positivos se señalan: accesibilidad a la ruta, tierra apta para la agricultura y la ganadería, libertad de culto, suficiente abastecimiento de agua, tranquilidad, armonía y el buen relacionamiento entre vecinos.



Principales actividades económicas

- Se dedican principalmente a la agricultura y la pequeña ganadería (vacas, cabras).
- Producen además para venta: leche, queso, huevo. Por lo general estos productos se venden en la ciudad de Loreto.
- Trabajo en las estancias: Quienes se dedican a esta actividad van a las estancias del Chaco o trabajan en las estancias cercanas por jornal o por trato.
- Comercio: existen además pequeñas despensas, bodegas, sitios de venta de combustibles, lavadero, gomería.



Situación del empleo: En la zona predomina la falta de fuentes de trabajo y la mayoría se emplea como jornalero haciendo changas. Aproximadamente el 40% de los que terminan sus estudios secundarios continúan formándose.



Despensa- Virgen del Camino



Actividades recreativas

- **Fiesta Patronal:** El 5 de octubre se celebra el día de la Virgen del Camino. En la misma fecha se recuerda además el Día del Camino. Se realizan festivales, rezo, procesión o santo corrido.
- **Club Hípico:** Jineteada
- **Torneo campesino:** participan las comunidades cercanas y es organizado a nivel parroquial.
- **Balnearios:** Las personas acuden a los balnearios de las zonas cercanas tales como: Balneario Itá, Paso Horqueta, San Josemí, María Auxiliadora.
- **Otras actividades:** Se organizan actividades para recaudar fondos a través de las cooperadoras escolares (ACE) y se celebra el día del niño.



Medios de comunicación

- **Radio:** Cristiana. 107.5 Misión de Dios. Se escucha hasta la ribera del río Paraguay, Paso Horqueta y Carayá Vuelta.
- **TV:** Por antena de Claro, principalmente.
- **Celular:** La mayoría tiene acceso a internet. La principal forma de comunicación es a través de WhatsApp.



Organizaciones / Asociaciones

- Comisión vecinal Virgen del Camino
- Junta de Saneamiento Virgen del Camino
- Comité de mujeres productoras Mburukuja Poty
- Delegados de base de Iglesia Católica
- Comité de agricultores
- Docentes agremiados a la OTEP y SINADIS
- Asociados a la FNC y Tekopyahu



Principales problemáticas económicas, sociales y culturales

- Pobreza y desigualdad: asociada principalmente a las necesidades existentes en la zona
- Falta fuentes de trabajo en la comunidad
- Trabajos esporádicos y mal remunerados
- Falta apoyo a la producción campesina, asistencia técnica, capacitación, fortalecimiento y generación de canales de comercialización
- Abigeato
- Bajo porcentaje de personas acceden a la universidad
- Deserción escolar
- Embarazo precoz



Aspectos necesarios para un mayor desarrollo

- Acceder a capacitaciones y oportunidades laborales
- Apoyo y fortalecimiento para los comités productivos
- Personal médico para mejorar la cobertura y atención
- Priorizar el acceso a una educación de calidad en todos los niveles formativos
- Iniciar con los trabajos para asfaltar la ruta que une Loreto con Paso Barreto

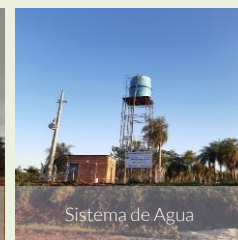


Acceso a servicios básicos

- **Agua potable:** La comunidad cuenta con 3 pozos para el abastecimiento de agua. El primer pozo solo se utiliza para lavar ropas y para los animales debido a que el agua es de color rojo, de esta dependen alrededor de 18 familias.
- **Red de desagüe:** No se cuenta con red de desagüe en la comunidad.
- **Pozo-Letrina:** La mayoría de las viviendas tienen baños con pozo ciego.
- **Medio de transporte:** El medio de transporte principal es la motocicleta. En la zona cuentan con servicio de ómnibus (privado)
 1. Paso Barreto - Concepción
 2. Puentesño- Concepción: día de por medio.
- **Tratamiento de basura:** No se cuenta con servicio de recolección de basura. En mayor porcentaje queman y en menor proporción depositan en hoyos.
- **Energía eléctrica:** Proveída por la ANDE.



Instituciones y sitios de interés





Santísima Trinidad



Información general

Zona: Rural

Distancia del centro urbano: A unos 30 km de la ciudad de Concepción (Loreto-Paso Barreto)

Municipio del cual depende: Loreto

División del territorio: Santísima Trinidad

Límites: Hugua Po'i, Jhugua Rivas, Virgen del Camino- La ruta Loreto-Paso Barreto

Principales vías de acceso: Ruta Loreto – Paso Barreto / Jhugua Rivas La Asunción

Habitantes: 619 personas en Hugua Po'i y Santísima Trinidad

Cantidad de familias/viviendas: Alrededor de 35 viviendas

Comunidades indígenas: No hay comunidades indígenas en la zona.



Aspectos históricos

Esta localidad se conformó entre los años 1968 y 1970, tras dividirse de la comunidad de Hugua Po'i.

Los primeros pobladores fueron Juan Pío Martínez, Florencio López, Manuel Reguera y Vidal Medina; quienes provenían de la zona de Hugua Po'i.

La llamaron Santísima Trinidad en honor al dogma que establece el trino divino. En el año 2002 se construyó el templo y en el 2004 la escuela. Ambas edificaciones llevan el mismo nombre que la comunidad.

En la actualidad, hay aproximadamente unas 35 casas desde el pozo artesiano que está sobre ruta, hasta el cruce que conecta con la localidad de Jhugua Rivas de la Asunción.

✓ **Entre los aspectos positivos se señalan:** tranquilidad, poco flujo vehicular, seguridad, participación comunitaria, tierra apta para producción y el hecho de ser una comunidad unida.



Principales actividades económicas

- La actividad principal es la agricultura y ganadería en pequeña escala; para consumo y también para venta.
- Un porcentaje de la población trabaja en las estancias del Chaco por jornal o por trato.
- Hay personas empleadas en el frigorífico que se trasladan diariamente a la capital departamental.
- También hay un sector que se dedica a la producción de miel de caña y ka'i ladrillo (dulce de maní), otros a la venta de leche y elaboración de queso.
- Asimismo, se menciona que existen pequeñas despensas que aportan al sustento familiar.



Actividad productiva: ganadería



Situación del empleo: Migración de jóvenes en busca de ofertas laborales y educativas. Se prefiere trabajar en las estancias del Chaco porque se recibe mejor remuneración que en las estancias de la zona. En el caso de la agricultura, el rubro de renta principal es el feijao. Se menciona, además, que varios productos dejaron de ser rentables debido a los bajos precios de venta.



Actividades recreativas

- **Fiesta patronal:** El 15 de junio es el día de la Santísima Trinidad, y la comunidad organiza fiestas y festivales en conmemoración.
- **Otras fiestas religiosas:** Día de San Antonio, María Auxiliadora, Caacupé, Divino Niño. Estas festividades son organizadas por familia, y participa la comunidad.
- **Club Hípico:** Se realizan carreras de caballo de manera semanal o quincenal. A la actividad asisten pobladores de la zona y de las ciudades de Concepción, Horqueta y San Alfredo.
- **Deportes:** Se realizan torneos de fútbol, vóley masculino y femenino.



Medios de comunicación

- **Radio:** Tekopyahu de Loreto
- **TV:** Canal 9, Telefuturo. La gente que tiene antena de Claro o Tigo ve otros canales.
- **Celular:** La mayoría tiene acceso a internet. La principal forma de comunicación es a través de WhatsApp.



Organizaciones / Asociaciones

- Comisión vecinal Santísima Trinidad
- Delegados de base de Iglesia Católica
- Comisión de agua (No a través de SENASA)
- Asociación de Cooperadora Escolar (ACE)
- Comité de Tekoporã



Principales problemáticas económicas, sociales y culturales

- Pobreza
- Falta fuentes de trabajo en la comunidad
- Comercialización de la producción campesina a bajo precio
- No hay mercado seguro para la comercialización de productos.
- Caminos en mal estado
- Se necesita ampliar los niveles de educación escolar. Solo se cuenta hasta el 6º grado en la comunidad.
- Red de abastecimiento de agua insuficiente



Aspectos necesarios para un mayor desarrollo

- Fuentes de trabajo
- Mejorar la red vial comunitaria
- Mercados seguros para la comercialización de productos de la agricultura familiar campesina a precios justos
- Ampliar la red de abastecimiento de agua de la comunidad
- Ampliar la cobertura de niveles educativos hasta el 9º grado



Acceso a servicios básicos

- **Red de abastecimiento de agua:** En la comunidad existen dos pozos artesianos (uno en la entrada sobre ruta que no se usa porque el agua posee un color rojo cobrizo y otro instalado en el predio de la escuela). Alrededor de seis familias no se abastecen del sistema por estar en zonas altas donde la presión del agua no es suficiente. Estas acarrear agua para consumo de los vecinos más cercanos. También tienen pozo en los hogares, pero durante la época de sequía no abastecen.
- **Red de desagüe:** No se cuenta con red de desagüe en la comunidad.
- **Pozo-Letrina:** Predomina el uso de letrinas (25 familias), y algunos hogares tienen baños con pozo ciego.
- **Medio de transporte:** Tienen acceso a ómnibus de empresas privadas desde la ruta Loreto-Paso Barreto, pero no se utiliza de manera frecuente. El medio de transporte principal es la motocicleta.
- **Tratamiento de basura:** No disponen de servicio de recolección de basura en la comunidad. Los pobladores queman sus residuos.
- **Energía eléctrica:** Proveída por la ANDE.



Instituciones y sitios de interés





Hugua Po'i



Información general

Zona: Rural

Distancia del centro urbano: A unos 32 km de la ciudad de Concepción (Loreto-Paso Barreto)

Municipio del cual depende: Loreto

División del territorio: Hugua Po'i

Límites: Santísima Trinidad, Jhugua Guazú, Ykua Porâ, Cerrito-Naranjatý, Jhugua Rivas La Asunción

Principales vías de acceso: Ruta Loreto-Paso Barreto / Horqueta- Naranjatý Ykua Porâ

Habitantes: 619 personas en Hugua Po'i y Santísima Trinidad

Cantidad de familias/viviendas: 121 viviendas

Comunidades indígenas: No hay comunidades indígenas en la zona.



Aspectos históricos

Antiguamente era zona de paso de carretas y caballos; se estima que desde hace unos 150 años empezó a conformarse la comunidad con pobladores provenientes principalmente de la zona de Ykua Porâ. Entre los pobladores de origen se encuentran los de apellido Páez. La población antigua está conformada en su mayoría por pobladores de la zona de Ykua Porâ.

Aproximadamente hace unos 180 años atrás, en el año 1840, un extranjero que se encontraba realizando los trabajos para la apertura del camino encontró una imagen de San Rafael, que coincidentemente es el santo patrono del viajero. Para los pobladores fue representativo el hallazgo por lo que se la conoce como Jhugua Po'i San Rafael.

En el año 1950, la comunidad se independizó de la localidad de Jhugua Guazú; periodo en el que también fueron construidos el oratorio y la escuela San Rafael.



Entre los aspectos positivos se señalan: Seguridad, la naturaleza, el lugar. La tierra es apta para la producción, y se tiene acceso a la ruta.



Principales actividades económicas

- Agricultura y ganadería; principalmente para consumo
- Un gran porcentaje de hombres trabaja en las estancias del Chaco, a partir de los 15 años.
- En la tabacalera se emplean mayoritariamente como "capataces" o encargados más que como productores.
- Algunos elaboran productos de limpieza.
- Hay familias subcontratadas por la ANDE para mantenimiento del tendido eléctrico.
- Pequeños comercios tales como: despensas, bodega, taller de motos y otros.



Despensa Copetín-Hugua Po'i



Situación del empleo: Predomina el trabajo en las estancias del Chaco. Se menciona que al menos el 20% es jornalero y también se dedica a la actividad agrícola. Al menos el 1.5% tuvo que emigrar al exterior en busca de fuentes de trabajo.



Actividades recreativas

- **Fiesta patronal:** 24 de octubre, San Rafael
- **Otras fiestas religiosas:** Virgen de Caacupé, San Antonio, María Auxiliadora y Divino Niño
- **Torneos:** Fútbol y vóley (hombres y mujeres)
- **Celebración:** Del Día del Niño y del Día de la Juventud en las escuelas
- **Desde la USF:** Se organizan actividades como charlas educativas, el club de embarazadas y el club de adultos mayores.



Medios de comunicación

- **Radio:** Tekopyahu, Regional, Aquidabán
- **TV:** por antena de Claro principalmente
- **Celular:** La mayoría tiene acceso a internet. La principal forma de comunicación es a través de WhatsApp.



Organizaciones / Asociaciones

- Comisión vecinal
- Comités productivos de mujeres (SAS)
- Grupo juvenil de la iglesia
- Comisión de la iglesia
- Subconsejo de salud
- Comisión de agua



Principales problemáticas económicas, sociales y culturales

- Pobreza y desigualdad
- Falta fuentes de trabajo en la comunidad
- Trabajos esporádicos mal remunerados
- Migración y desarraigo
- Falta apoyo a la producción campesina, asistencia técnica, capacitación, fortalecimiento y canales de comercialización.
- Ausencia de oferta educativa terciaria en la zona
- Deserción escolar
- Problemas de abastecimiento de agua



Aspectos necesarios para un mayor desarrollo

- Formación profesional y generación de oportunidades laborales
- Seguridad laboral y mejor remuneración
- Ampliar la oferta educativa y acceder a una educación de calidad en todos los niveles formativos
- Generar proyectos productivos sustentables para las familias
- Apoyo, formación y fortalecimiento para los comités productivos ya existentes
- Ampliar o mejorar la red de abastecimiento de agua



Acceso a servicios básicos

- **Red de abastecimiento de agua:** En la comunidad cuentan con red de agua potable a través de la Junta de Saneamiento. Se utiliza para consumo y uso cotidiano.
- **Red de desagüe:** No se cuenta con red de desagüe en la comunidad.
- **Pozo-Letrina:** Baños con pozo ciego en la mayoría de las casas. Se estima que el 20% de las viviendas poseen letrinas.
- **Medio de transporte:** El medio de transporte principal es la motocicleta. En la zona cuentan con servicio de ómnibus (privado): Paso Barreto - Huguá Po'i - Concepción.
- **Tratamiento de basura:** No se cuenta con servicio de recolección de basura. En mayor porcentaje queman y en menor medida depositan en hoyos.
- **Energía eléctrica:** Proveída por la ANDE. Se cuenta con un transformador por cada 8 o 9 casas.



Instituciones y sitios de interés



Esc. Básica 1727 San Rafael



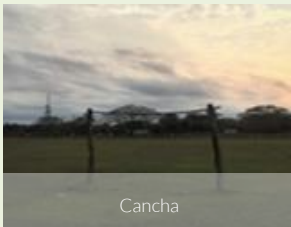
Colegio Nacional Huguá Po'i



Subcomisaría 17 Huguá Po'i



Sistema de agua



Cancha



USF-Huguá Po'i



Dispensario de salud



Sitio de venta de combustible



Capilla San Rafael



Jhugua Guazú



Información general

Zona: Rural

Distancia del centro urbano: A unos 36 km de la ciudad de Concepción (Loreto-Paso Barreto)

Municipio del cual depende: Loreto

División del territorio: Jhugua Guazú se divide en 3 zonas

Límites: Estancias Tupa Mba'e, Estancia Buenaventura. Comunidades de Jhugua Poi, Jhugua Rivas La Asunción y Jhugua Bonete

Principales vías de acceso: Ruta Loreto-Paso Barreto, Jhugua Rivas La Asunción, Jhugua Bonete

Habitantes: 1061 personas

Cantidad de familias/viviendas: 603 familias en las zonas de Jhugua Bonete, Jhugua Rivas Boquerón, Islería, Laguna Cristo Rey, Anderi Jhugua Guazu, Jhugua Bonete

Comunidades indígenas: No hay comunidades indígenas en la zona.



Aspectos históricos

Se conformó hace más de 70 años. Durante la época de la revolución del 47 ya había pobladores en la zona; varios de ellos ex combatientes de la Guerra del Chaco. Los apellidos más conocidos son: Obelar y Medina. Entre los primeros pobladores se encuentran el Monseñor Alejo Obelar y Leonardo Obelar.

Entre los aspectos positivos se señalan: Tranquilidad, y el lugar, la tierra es apta para producción; y se destacan además la unidad, solidaridad, la organización y la gente.



Principales actividades económicas

- Agricultura, producción hortícola con sistema de riego para autoconsumo y venta. Por lo general comercializan en la ciudad de Loreto.
- Los varones migran al Chaco para trabajar en las estancias, frigoríficos y tambos (Loma Plata), desde los 15 años.
- Las mujeres migran a las ciudades para trabajar de empleadas domésticas, algunas continúan estudiando; y otras van al exterior en busca de oportunidades laborales.
- De la producción ganadera se comercializa leche, queso.
- Algunos se dedican a la cría de gallinas y venden huevos.



Situación del empleo: Escasa oferta laboral en la zona. La gente migra por cuestiones de estudio o trabajo.



Actividades recreativas

- **Fiesta patronal:** Sagrado Corazón de Jesús. Se celebra en junio, dependiendo del calendario religioso. Participan de la celebración las personas de las comunidades cercanas y pobladores del lugar.
- **Hípico:** Carrera de caballo de manera semanal, dependiendo de la época.
- **Torneo de fútbol:** Principalmente participan equipos conformados por hombres. Se están incorporando las mujeres en la categoría de fútbol 5.
- **Otras celebraciones:** Festejo del Día del Niño y del Día de la Juventud en las instituciones educativas de la zona.



Medios de comunicación

- **Radio:** Tekopyahu (Loreto), Regional (Concepción)
- **TV:** por antena
- **Celular:** La mayoría tiene acceso a internet. La principal forma de comunicación es a través de WhatsApp.



Organizaciones / Asociaciones

- Comisión vecinal
- Comité productivo María Auxiliadora
- Comité de agricultores y horticultores
- Comisión de la iglesia
- Clubes deportivos



Principales problemáticas económicas, sociales y culturales

- Falta fuentes de trabajo a nivel local
- Pobreza
- Migración en busca de oportunidades laborales y educativas
- Existen profesionales, pero no pueden ocuparse en su área formativa.
- Abigeato
- Desarraigo
- Aún persisten prácticas machistas orientadas a asignar tareas del hogar a las mujeres y tareas productivas a los hombres.



Aspectos necesarios para un mayor desarrollo

- Fuentes de trabajo y seguridad laboral
- Evitar la migración y el desarraigo
- Mejorar los caminos vecinales
- Asistencia técnica y acompañamiento sostenido a productores locales con miras a la comercialización de productos y la generación de mercados seguros



Acceso a servicios básicos

- **Red de abastecimiento de agua:** Cuentan con red de abastecimiento a través de la Junta de Saneamiento. Además, cuentan con dos pozos instalados para la producción con sistema de riegos. Algunas personas tienen pozos particulares en sus viviendas.
- **Red de desagüe:** No se cuenta con red de desagüe en la comunidad.
- **Pozo-Letrina:** Más del 50% de las viviendas aún cuentan con letrinas y un porcentaje menor baños con pozo ciego.
- **Medio de transporte:** El medio de transporte principal es la motocicleta. Sobre la ruta principal se puede acceder al servicio de ómnibus privados: Paso Barreto a Concepción.
- **Tratamiento de basura:** En algunas viviendas clasifican las basuras, ya que tienen chacras y esta le sirve de abono. Los productos inorgánicos son quemados o arrojados en hoyos.
- **Energía eléctrica:** Proveída por la ANDE.



Instituciones y sitios de interés





Islería



Información general

Zona: Rural

Distancia del centro urbano: A unos 44 km de la ciudad de Concepción (Loreto-Paso Barreto)

Municipio del cual depende: Loreto

División del territorio: Islería

Límites: Estancia Santa Teresa, Laguna Cristo Rey, Jhugua Guazú, Río Aquidabán, Estancia Santa Teresa, Naranjatý

Principales vías de acceso: Ruta Loreto-Paso Barreto

Habitantes: Alrededor de 108 personas

Cantidad de familias/viviendas: Aproximadamente 25 casas; pero no todas están habitadas

Comunidades indígenas: No hay comunidades indígenas en la zona.



Aspectos históricos

La comunidad posee unos 150 años de antigüedad. Su conformación data de principios de la Guerra Grande. En la actualidad existen unas 25 casas; de las cuales algunas no están habitadas.

Los apellidos más antiguos son Zavala, Colman, Miskinich, Cristaldo y Saveiro. Los Martínez migraron de la zona de Puerto Pinasco en el año 1975; y los Saveiro eran oriundos de Ykua Porã.

Recibe el nombre de Islería por poseer características similares a las de una isla en épocas de lluvia y creciente; ya que las zonas donde se encuentran la Laguna Tajy, el Arroyo Javevy'y y el Río Aquidabán solían desbordarse a menudo; dificultando el acceso y quedando el territorio completamente aislado.



Entre los aspectos positivos se señalan: Tranquilidad, el lugar, la solidaridad entre vecinos, la gente es buena, trabajadora y tiene ganas de superarse.



Principales actividades económicas

- Pequeña ganadería (entre 10 a 15 vacas)
- Pequeñas granjas y chacras para autoconsumo
- Cría de ganado menor
- Trabajo en las estancias del Chaco y algunos casos en las estancias cercanas
- Venta de leche, queso, huevo, gallina, chanco
- Pesca



Situación del empleo: Casi la totalidad realiza alguna actividad por jornal (changas). Se sustentan de la agricultura y la cría de ganado para consumo y venta según necesidad. Un jornal diario equivale a 65 mil guaraníes dependiendo del trabajo que se solicite.



Actividades recreativas

- **Fiesta patronal:** 1 de octubre, Santa Teresita del Niño Jesús, se comparte con la comunidad en el tinglado de la iglesia. Entre las actividades que se realizan durante la festividad se mencionan:
 - **Laceada:** se realiza en el terreno de la iglesia. Doma de toro.
 - **Torneo de fútbol 5:** principalmente entre adultos.
- **Hípico:** Carrera de caballo de manera semanal, dependiendo de la época.
- **Otras actividades:** En la escuela cada año se festeja el Día del Niño con actos culturales y fiesta.



Medios de comunicación

- **Radio:** Tekopyahu (Loreto), Ypané y Regional (Concepción)
- **TV:** por antena principalmente, Telefuturo
- **Celular:** La mayoría tiene acceso a internet. La principal forma de comunicación es a través de WhatsApp. Tienen un grupo conformado por pobladores actuales y también personas que vivieron en la comunidad pero que migraron en busca de mejores oportunidades.



Organizaciones / Asociaciones

- Comisión vecinal
- Comité de mujeres Santa Teresita del Niño Jesús (Tekoporá)
- Referentes de base de la capilla
- Comisión de agua



Principales problemáticas económicas, sociales y culturales

- Pobreza y desigualdad: asociadas principalmente a las necesidades existentes en la zona
- Falta de fuentes de trabajo en la comunidad
- Abigeato en un porcentaje mínimo, y en casos aislados
- No hay un recambio para la producción, la mayoría son adultos mayores.
- Pocos estudiantes en la escuela debido a que el porcentaje de natalidad en la zona es bajo
- Migración y desarraigo



Aspectos necesarios para un mayor desarrollo

- Mejorar los caminos vecinales

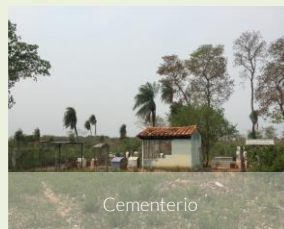


Acceso a servicios básicos

- **Red de abastecimiento de agua:** La comunidad cuenta con un pozo instalado por los pobladores sin asistencia de SENASA.
- **Red de desagüe:** No se cuenta con red de desagüe en la comunidad.
- **Pozo-Letrina:** Del total de viviendas, 15 familias cuentan letrinas y las 10 restantes tienen instalados baños con pozo ciego.
- **Medio de transporte:** El medio de transporte principal es la motocicleta. En la zona cuentan con servicio de ómnibus (privado): Paso Barreto - Concepción (TTL).
- **Tratamiento de basura:** No se cuenta con servicio de recolección de basura. En mayor porcentaje queman los residuos.
- **Energía eléctrica:** Proveída por la ANDE desde el año 2000 aproximadamente.



Instituciones y sitios de interés





Laguna Cristo Rey



Información general

Zona: Rural

Distancia del centro urbano: A unos 48,9 km de la ciudad de Concepción (Loreto-Paso Barreto)

Municipio del cual depende: Loreto

División del territorio: Laguna Cristo Rey

Límites: Anderí, Estancia Cristo Rey, Estancia Reino, Estancia Buena Vista y la Ruta de Loreto- Paso Barreto, Estancia Buena Vista

Principales vías de acceso: Ruta Loreto-Paso Barreto, Anderí-Potrero Tacuara - Calle 12-Horqueta (inhabilitada)

Habitantes: 224 personas

Cantidad de familias/viviendas: Más de 50 familias

Comunidades indígenas: No hay comunidades indígenas en la zona.



Aspectos históricos

Empezó a poblarse antes del año 1870, posee unos 150 años de antigüedad. Se denomina Cristo Rey en honor al Santo Patrono de la comunidad y Laguna debido a que existe un arroyo en la zona.

La construcción de la iglesia se realizó en el año 1920 y está ubicada frente a la Escuela N° 1723 Andrés T. Morel Cristaldo.

Entre los primeros pobladores se encuentran los de apellido Morel, Giménez, Cristaldo y Salomón; estos últimos provenientes de Italia y Francia. Actualmente existen unas 50 casas a lo largo del territorio.



Entre los aspectos positivos se señalan: el lugar, la naturaleza, la tranquilidad y el hecho de ser una zona segura.



Principales actividades económicas

- Predomina la ganadería en pequeña escala.
- Se realizan actividades de granja y cría de ganado menor.
- La agricultura es preferentemente para autoconsumo; la chacra y la huerta familiar son tareas asumidas por las mujeres.
- Por lo general los hombres trabajan en las estancias del Chaco como empleados, otros en las estancias de la zona y algunos son macateros.
- En la zona también están los que se desempeñan como empleados públicos en las instituciones educativas.
- Los pobladores de la comunidad se dedican a la venta de queso, leche, huevo y animales menores. Existen compradores que se abastecen de la comunidad para luego comercializar los productos en las ferias.
- Existen además personas que tienen pequeños comercios tales como: despensas, comedor, venta de minicarga y carbón.



Situación del empleo: No hay fuentes de trabajo en la zona; hay mucha gente que se ve obligada a salir de la comunidad en busca de oportunidades de empleo. La mayoría se sustenta a través de trabajos esporádicos y puntuales (changas); por consiguiente, no tienen ingresos seguros. También hay profesionales que no pueden emplearse en su área de estudio debido a la falta de oportunidades.



Comedor



Actividades recreativas

- **Fiesta patronal:** Cristo Rey, se celebra el tercer domingo de noviembre. Se organiza laceda mecánica (moto), participan alrededor de 50 a 60 caballos y jinetes. La recaudación es para la iglesia.
- **Deporte:** Se realizan torneos de fútbol.
- **Otras actividades:** En la escuela se organizan festivales, se celebra el Día del Niño y el Día de la Juventud.



Medios de comunicación

- **Radio:** Paso Barreto, Loreto y Arroyito
- **TV:** Por antena, sin eso no hay señal
- **Celular:** La mayoría tiene acceso a internet. La principal forma de comunicación es a través de WhatsApp.



Organizaciones / Asociaciones

- Comisión vecinal
- Comisión de agua
- Comité de iglesia



Principales problemáticas económicas, sociales y culturales

- Pobreza
- Falta fuentes de trabajo en la comunidad
- Falta apoyo a la producción campesina, asistencia técnica, capacitación, fortalecimiento y generar canales de comercialización.
- Poca presencia del Estado
- Falta oportunidades para las mujeres y jóvenes (capacitación, iniciativas productivas).
- Migración de jóvenes en busca de oportunidades laborales y educativas
- Desarraigo



Aspectos necesarios para un mayor desarrollo

- Mayor presencia del Estado
- Generar fuentes de trabajo
- Apoyo a la agricultura familiar campesina (capacitación, acompañamiento y asistencia técnica sostenida para la producción del campo)
- Instalar una unidad de salud en la zona
- Tener acceso al almuerzo escolar

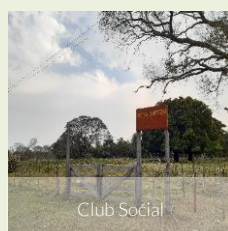
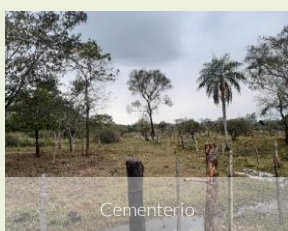


Acceso a servicios básicos

- **Agua potable:** Pozo instalado por la Secretaría de Emergencia Nacional en el 2010. Es autogestiva, no se gestionó con SENASA y abastece a toda la comunidad.
- **Red de desagüe:** No se cuenta con red de desagüe en la comunidad.
- **Pozo-Letrina:** Baño con pozo ciego en un 70 %.
- **Medio de transporte:** El medio de transporte principal es la motocicleta. Anteriormente ingresaba la empresa de transporte Amanecer, pero el dueño de la misma falleció y dejó de funcionar. En la ruta cuentan con servicio de ómnibus (privado): Paso Barreto-Concepción (Empresa TTL).
- **Tratamiento de basura:** No se cuenta con servicio de recolección de basura. En mayor porcentaje queman y una población menor deposita en hoyos.
- **Energía eléctrica:** Proveída por la ANDE.



Instituciones y sitios de interés





Anderi



Información general

Zona: Rural

Distancia del centro urbano: A unos 63 km de la ciudad de Concepción (Loreto-Paso Barreto)

Municipio del cual depende: Loreto

División del territorio: Anderi

Límites: Estancia Cristo Rey, Estancia Isla Guazú, Potrero Tacuara, Laguna Cristo Rey

Principales vías de acceso: Laguna Cristo Rey, Ruta Loreto-Paso Barreto, Potrero Tacuara (callejón que está inhabilitado)

Habitantes: 94 personas aprox

Cantidad de familias/viviendas: Entre 20 a 24 viviendas

Comunidades indígenas: No hay comunidades indígenas en la zona



Aspectos históricos

El nombre de Anderi se vincula a la historia de un joven secretario que murió de sed durante la época de sequía mientras visitaba los campos menos poblados de la zona. Hay una cruz que lleva el nombre de Manuel Anderi para recordarlo.

Los inicios de la comunidad se remontan a los años 1920.

Existen tres grandes familias en la zona: Alcaraz, Ocampos y Giménez. Los primeros pobladores provenían principalmente de las comunidades de Domínguez Nigó y Jhugua Ocampos.

Para acceder al territorio se atraviesa un puente de madera construido por los lugareños; que a su vez es utilizado para conectar con la localidad de Laguna Cristo Rey, y tener salida a la ruta que une Loreto con Paso Barreto.

Las casas están construidas en las zonas altas; por lo que hay muy pocas viviendas visibles desde el camino. Esto se debe a que en épocas de lluvia es recurrente el desborde del arroyo; por lo que se altera la dinámica de entrada y salida del lugar ya que se inundan los caminos y la comunidad queda aislada.



Entre los aspectos positivos se señalan: la tranquilidad, la tierra es apta para la producción, la solidaridad y el buen relacionamiento entre los pobladores, el arraigo por parte de los pobladores.



Principales actividades económicas

- Pequeña ganadería y cría de animales menores para consumo y venta según necesidad
- Los productos de la chacra y huerta son principalmente para consumo.
- Hay personas que se dedican a la elaboración de queso para venta. Hay compradores que llegan hasta la zona para abastecerse y luego volver a vender en la ciudad de Concepción.
- Elaboración y venta de sombreros de Karanda'y
- Se menciona además que en la zona hay un pequeño almacén con productos básicos de consumo familiar y una carpintería.
- Por lo general se dedican a realizar actividades por jornal (changas); y algunos van a trabajar a la ciudad de Concepción.



Situación del empleo: Es una zona que se sustenta de la producción del campo para autoconsumo principalmente, un alto porcentaje realiza trabajos por jornal (changas). No hay empleos fijos, la escuela es la única institución pública de la zona que funciona bajo la peculiaridad de poseer un sistema unidocente.



Actividades recreativas

- **Fiesta patronal:** Virgen del Rosario, se celebra el 6 de octubre. Se realizan festivales, doma de toro mecánico, rezo, karu guasu, recorrido del santo, bingo, torneo de fútbol, entre otras actividades.
- **En las escuelas:** Se festeja el Día del Niño.



Medios de comunicación

- **Radio:** Concepción y Aquidabán de Paso Barreto, Radio Cristal de Arroyito
- **TV:** SNT (canal de aire), el resto por antena
- **Celular:** La mayoría tiene acceso a internet. La principal forma de comunicación es a través de WhatsApp, pero tienen problemas de cobertura en la zona.



Organizaciones / Asociaciones

- Comisión vecinal
- Comisión de festejo para la celebración de la fiesta patronal (es puntual para la actividad)
- Asociación de Cooperadora Escolar (ACE)



Principales problemáticas económicas, sociales y culturales

- Pobreza y desigualdad: asociada principalmente a las necesidades existentes en la zona
- Faltan fuentes de trabajo en la comunidad.
- Caminos en mal estado
- Falta apoyo a la producción campesina, asistencia técnica, capacitación, fortalecimiento y canales para la comercialización de productos; sobre todo en época de creciente.
- Crisis económica, que se agudizó con la pandemia (escaso y nulo movimiento económico)
- Pérdida de producción en época de creciente, que no es asistida por parte del gobierno local.
- Escasa presencia del Estado en la zona
- Desborde del arroyo



Aspectos necesarios para un mayor desarrollo

- Mejorar los caminos vecinales
- Construcción de una Unidad de Salud en la zona
- Acceso a una red de abastecimiento de agua comunitaria
- Asistencia técnica sostenida para la producción familiar campesina

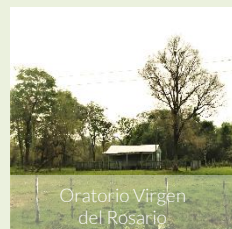


Acceso a servicios básicos

- **Agua potable:** En la comunidad tienen pozos o tajamares en sus terrenos. Durante la sequía hay problemas de abastecimiento de agua.
- **Red de desagüe:** No se cuenta con red de desagüe en la comunidad.
- **Pozo-Letrina:** La mayoría de los hogares tiene letrina.
- **Medio de transporte:** El medio de transporte principal es la motocicleta. No cuentan con servicio de ómnibus.
- **Tratamiento de basura:** No se cuenta con servicio de recolección de basura. En mayor porcentaje queman.
- **Energía eléctrica:** Proveída por la ANDE, desde hace aproximadamente 10 años.



Instituciones y sitios de interés





Paso Barreto



Información general

Zona: Rural

Distancia del centro urbano: A unos 58 km de la ciudad de Concepción (Loreto-Paso Barreto)

Municipio del cual depende: Paso Barreto

División del territorio: Inmaculada Concepción, María Auxiliadora, San Salvador, Santo Domingo, 6 de Agosto, Nuevo Barrio y un sector denominado Ex Carbonería

Límites: Al Norte con Estancia Prosperidad, al sur con Isla Tuyu, al oeste con el río Aquidabán – Loreto y al este: Estancia Rancho Z

Principales vías de acceso: Ruta Loreto. Paso Barreto, Calle 15, Cruce x, San Alfredo, Jhugua Ñandu-P. Mbutu – Horqueta

Habitantes: 1100 personas aprox.

Cantidad de familias/viviendas: 862 familias

Comunidades indígenas: Existen 3 comunidades indígenas situadas en la zona Norte del Distrito, una de ellas linda con el departamento de Amambay. Son de la etnia Mbya Guaraní y Pa'i Tavytera. Son unas 123 familias: Jeguahaty (55 familias), Tacuarendyju (13) y Vy'a Renda (45).



Aspectos históricos

La ciudad de Paso Barreto empezó a poblarse en el año 1800. Durante la época de la Guerra Grande pasaron las tropas del Mariscal López. Cuentan que cerca del río Aquidabán vivía un hombre de apellido Barreto, en una zona de paso donde los habitantes referenciaban como "el paso de don Barreto", de esta denominación proviene el origen de su nombre.

Con la creación del Ministerio de Obras Públicas, durante el periodo del General Samaniego, la zona empezó a crecer y desarrollarse a nivel de infraestructura. Todas las instituciones que se crearon se iniciaron en su época. El 26 de agosto de 1970 se realizó la apertura oficial de la escuela que lleva su nombre y queda aproximadamente a unos 500 metros del río Aquidabán.

Los apellidos más conocidos de la zona son: Sánchez, Franco, López, Blanco. Los Luschich eran emigrantes de Checoslovaquia que vinieron después de la Guerra del Chaco. También algunos excombatientes se quedaron a poblar el territorio.

Durante la época de auge de los aserraderos muchas personas provenientes principalmente de Curuguaty empezaron a asentarse en el lugar. En la actualidad algunos provienen de las localidades de Concepción, Pedro Juan Caballero y Coronel Oviedo, principalmente para trabajar por temporadas.

La distritación de Paso Barreto es reciente, la misma se realizó el 31 de mayo de 2013 y es una fecha emblemática para los pobladores de la zona.



Entre los aspectos positivos se señalan: Tranquilidad, seguridad, no hay delincuencia, la unidad entre la gente, el ambiente y el bajo nivel de contaminación. Además, se menciona que el río y la playa son atractivos turísticos durante las épocas de elevada temperatura.



Principales actividades económicas

- Agricultura, huerta y horticultura principalmente para consumo; una sola familia se dedica a la venta.
- Ganadería en pequeña y gran escala (estancias)
- Trabajo en las estancias cercanas (empleados fijos)
- Aserraderos (piso de parquet, incienso). Desde 1994 empezaron a funcionar los primeros aserraderos, después fue mermando debido a la falta de materia prima.
- Pesca para venta y autoconsumo
- Algunos se dedican a la producción y venta de carbón.
- Las mujeres se dedican a la venta de comida, peluquería, confección de ropa con el apoyo del SNPP.
- Comercio: despensa, copetín, servicio de minicarga, entre otros
- Funcionarios públicos: algunos se emplean como docentes en escuelas y colegios; otros trabajan en la USF, la Municipalidad u otras instituciones del Estado.
- Migración con fines laborales a las ciudades de Concepción, Asunción, y también a países como España
- Venta ambulante de frutas y verduras
- Hay pequeños talleres de moto y automóviles donde la gente también se emplea.



Situación del empleo: Hay mucho desempleo en la zona. Durante la pandemia, se registra un aumento de la venta de comida rápida y más elaboradas; también se incrementaron las huertas familiares (al menos una por vivienda).

Hay algunas personas que se encontraban empleadas en otras ciudades como Ciudad del Este, y tuvieron que regresar debido al contexto Covid-19.

En la ciudad funcionan aserraderos (compradores de Filadelfia, exportación de piso parquet e incienso). Se menciona que la producción disminuyó por falta de materia prima.

En la zona son mayoritariamente jornaleros, muchos de ellos jóvenes que se dedican a realizar changas ("por díaseros") limpian casas, acarrear arena, abono, y trabajan el aserradero.

Escasos empleos para las mujeres: algunas son funcionarias del Estado, en su mayoría ama de casas y por lo general migran a otras ciudades.



Actividades recreativas

- **Fiesta Patronal:** El 8 de agosto se celebra el día de Santo Domingo.
- **Deportes:** Torneo de fútbol de mujeres y hombres (hay una escuela de fútbol). Además, se inició la liga de varones y mujeres; la principal es la liga juvenil. Se practica también vóley y piki vóley.
- **Hípico:** Carrera de caballo. Laceda, el club de lazo eso es lo que más atrae gente de otros lugares.
- **Festival Municipal** de Paso Barreto del río Aquidabán
- **Fiestas bailables:** Los fines de semana, organizadas por las comisiones de la comunidad.
- **Desfile:** El principal se realiza en junio por la Paz del Chaco y el aniversario de distritación; ya que se juntan ambos eventos en una celebración.
- **En las instituciones educativas:** Se organizan torneos interescolares e intercolegiales o intercambio e interdistritales desde la ACE o el EGIE.
- **Turismo:** Playa en el río Aquidabán. Suelen ir personas a pescar o pasar el día.
- **Actividades de la USF:** Club de embarazadas y de madres, octubre rosa. Con pacientes diabéticos se realizan charlas y actividades lúdicas.



Medios de comunicación

- **Radio comunitaria:** Aquidabán Comunicaciones y Santa Cecilia, Lira FM, Radio Regional (Concepción)
- **TV:** por antena principalmente (Claro, Tigo y Personal)
- **Celular:** La mayoría tiene acceso a internet. La principal forma de comunicación es a través de WhatsApp. Facebook: página de actividades de la Municipalidad.



Organizaciones / Asociaciones

- | | |
|---|---|
| <ul style="list-style-type: none"> • Comisiones vecinales • Comisiones de iglesia • Grupos juveniles de la iglesia y los colegios • Asociación de Cooperadores Escolares-ACE y EGIE | <ul style="list-style-type: none"> • Consejo de salud • Asociación de la radio Aquidabán • Comisión de agua Junta de Saneamiento • Comisión de mujeres (Tekoporà) |
|---|---|



Principales problemáticas económicas, sociales y culturales

- | | |
|---|---|
| <ul style="list-style-type: none"> • Pobreza • Faltan fuentes de trabajo en la comunidad, principalmente para jóvenes y mujeres. • Migración en busca de oportunidades laborales y educativas (Asunción y Concepción) • Desarraigo • Contaminación debido a la utilización de hornos para carbón | <ul style="list-style-type: none"> • Conflictos cuando hay presencia de personas que no son del lugar • Falta educación sexual debido al aumento de embarazos adolescentes. • Inundación • Falta oferta educativa terciaria (universidades). • Machismo por cuestiones culturales y religiosas |
|---|---|



Aspectos necesarios para un mayor desarrollo

- Fuentes de trabajo y remuneración justa
- Generación de oferta educativa universitaria
- Apoyo a la producción campesina, asistencia técnica sostenida, mercado seguro, comercialización a precios justos de venta
- Trabajo articulado entre partidos políticos de cara al desarrollo del municipio
- Mejorar los caminos vecinales
- Instalación de industria de lácteos
- Invertir en recuperación del caudal del río



Acceso a servicios básicos

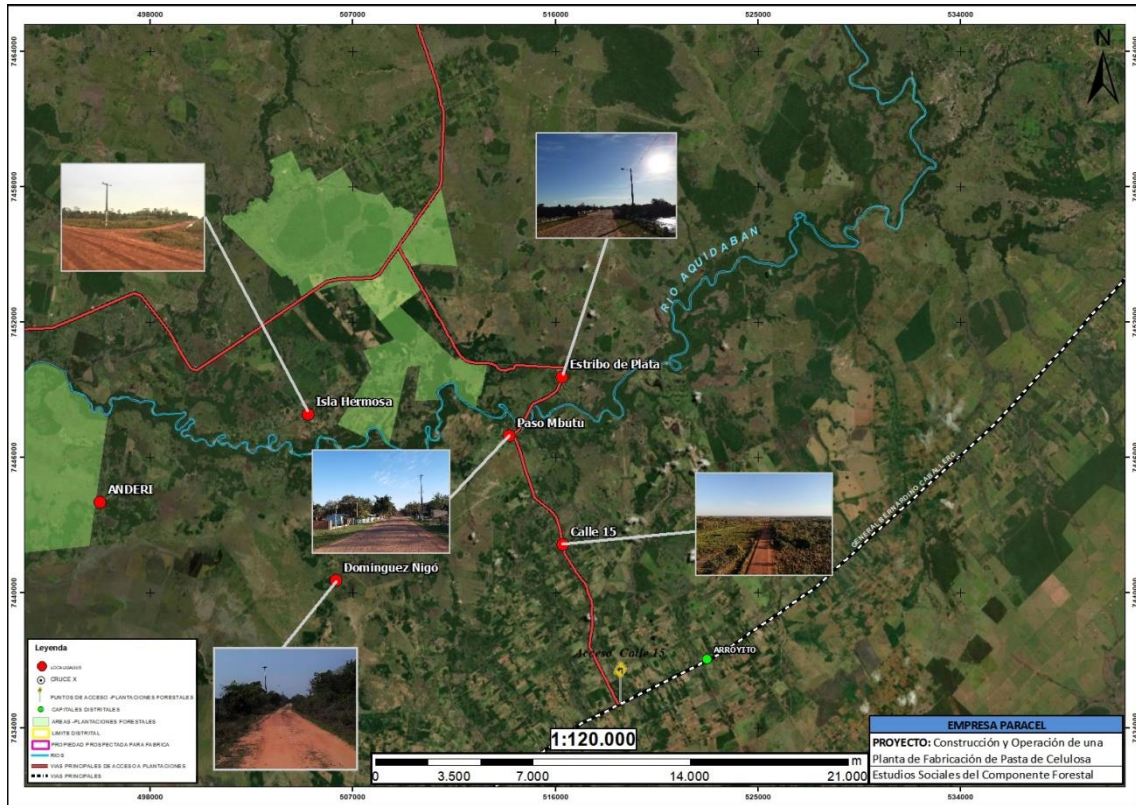
- **Red de abastecimiento de agua:** Cuentan con red de agua potable, se organizan a través de juntas de saneamiento.
- **Red de desagüe:** Cuenta con desagüe pluvial y alcantarillado sanitario en algunos lugares de la zona urbana.
- **Pozo-Letrina:** La mayoría de los hogares en la zona urbana de Paso Barreto tienen baños con pozo ciego y cámara séptica debido al terreno.
- **Medio de transporte:** El medio de transporte principal es la motocicleta. En la zona cuentan con servicio de ómnibus (privado). Empresa TTL-Paso Barreto. Paso Barreto hasta concepción día de por medio. Jhugua Ñandú-Horqueta.
- **Tratamiento de basura:** No se cuenta con servicio de recolección de basura. En mayor porcentaje queman y una población menor deposita en hoyos. En el predio de la Municipalidad queman una vez por semana en un horno.
- **Energía eléctrica:** Proveída por la ANDE.



Instituciones y sitios de interés



Mapa Acceso Calle 15 (Zona Sur)



El acceso conocido como Calle 15, se encuentra en el límite del distrito de Horqueta y Arroyito. Este trayecto conecta con las comunidades de: Calle 15, Dominguez Nigó, Isla Hermosa, Paso Mbutu y Estribo de Plata.



Calle 15 (Norte)



Información general

Zona: Rural

Distancia del centro urbano: A unos 78 km de la ciudad de Concepción (Ruta V-Calle 15)

Municipio del cual depende: Horqueta

División del territorio: Calle 15 Zona Norte

Límites: Calle 14, Paso Mbutu, Arroyito, Ruta V- Calle 15 Sur

Principales vías de acceso: Ruta V, Calle 14, Paso Mbutu

Habitantes: 241 personas

Cantidad de familias/viviendas: Alrededor de 51 familias

Comunidades indígenas: No hay comunidades indígenas en la zona.



Aspectos históricos

La escuela de la comunidad se fundó en 1960; pero alrededor de 1900 ya empezó a habitarse la zona. Se la conoce como calle 15 debido a que desde el municipio de Horqueta cada dos mil metros hay callejones que están enumerados.

Calle 15 Norte, está más próxima a la localidad de Paso Mbutu; y Calle 15 Sur se encuentra del otro lado de la ruta V.

A su vez, el callejón (camino) divide a la comunidad de Horqueta y Arroyito desde la distritación de este último en el año 2016.

Además, se menciona que entre los primeros pobladores se encuentran los de apellido Alarcón, Benítez y Pereira.



Entre los aspectos positivos se señalan: que los pobladores se conocen, son solidarios; y la comunidad es tranquila.



Principales actividades económicas

- Ganadería en pequeña escala principalmente
- Agricultura para consumo; los rubros de renta son el sésamo, la sandía, la piña y el feijao.
- Pequeños comercios: despensa, lugares de venta de combustible
- Algunos funcionarios, docentes y mayormente jubilados del sector



Situación del empleo: Los jóvenes migran al terminar el colegio a ciudades como Pedro Juan Caballero o Asunción. Esto se debe principalmente a la falta de empleos en la zona.



Actividades recreativas

- **Fiesta patronal:** Divino Niño, se celebra el 20 de julio. Se realiza una misa, procesión y un gran almuerzo en la comunidad.
- **Deportes:** Torneos de fútbol, vóley, carrera de 100 m llano (en calle 15 Sur)
- **Otras celebraciones:** La ACE se encarga de organizar torneos para recaudar fondos. Se celebra el Día del Niño.



Medios de comunicación

- **Radio:** Comunitaria 102.5 y Radio Cristal (Arroyito), Los Ángeles (Horqueta)
- **TV:** SNT y Telefuturo por antena
- **Celular:** La mayoría tiene acceso a internet. La principal forma de comunicación es a través de WhatsApp. No hay buena señal en la zona.



Organizaciones / Asociaciones

- Comisión de iglesia
- Comisión de Deporte (carrera)
- Asociación de Cooperadora Escolar (ACE)



Principales problemáticas económicas, sociales y culturales

- Faltan fuentes de trabajo en la comunidad.
- Escasa presencia del Estado en la zona
- Migración, en su mayoría jóvenes
- No se cuenta con red de abastecimiento de agua potable. El agua es salada.



Aspectos necesarios para un mayor desarrollo

- Apoyo y presencia del Estado en la comunidad
- Instalar un sistema de abastecimiento de agua potable en la zona



Acceso a servicios básicos

- **Agua potable:** En la comunidad no dispone de agua potable para consumo. En las viviendas cuentan con pozos particulares o tajamares para el uso diario.
- **Red de desagüe:** No se cuenta con red de desagüe en la comunidad.
- **Pozo-Letrina:** Aproximadamente el 70% de los hogares aún cuentan con letrina, el 30 % restante con pozo ciego.
- **Medio de transporte:** El medio de transporte principal es la motocicleta. En la zona cuentan con servicio de ómnibus (privado): Jhugua Ñandu - Concepción, Puentesño - Concepción (día de por medio).
- **Tratamiento de basura:** No se cuenta con servicio de recolección de basura. En mayor porcentaje queman.
- **Energía eléctrica:** Proveída por la ANDE, desde 1990 aproximadamente.

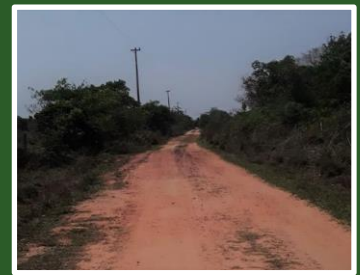


Instituciones y sitios de interés





Domínguez Nigó



Información general

Zona: Rural

Distancia del centro urbano: A unos 77 km de la ciudad de Concepción (Ruta V)

Municipio del cual depende: Horqueta

División del territorio: Domínguez Nigó

Límites: Isla Hermosa, Paso Senda, Potrero Tacuara

Principales vías de acceso: Loreto-Anderi, Potrero Tacuara, desde Isla Hermosa (en canoa). Desde Paso Mbutu por calle 12. Desde Horqueta por Callejón 40, calle 10, 11 y 12

Habitantes: No mencionan

Cantidad de familias/viviendas: Alrededor de 36 familias

Comunidades indígenas: No hay comunidades indígenas en la zona.



Aspectos históricos

La comunidad tiene aproximadamente 25 años de antigüedad. Las casas distan entre 2 a 3 km unas de otras.

Entre los primeros pobladores están los de apellido Zabala, Giménez y Fernández.



Entre los aspectos positivos se señalan: la gente, el hecho de que todos se conocen y la tranquilidad.



Principales actividades económicas

- Elaboración de sombreros de Karanda'y para venta a las despensas de la comunidad o a un "patrón" que comercializa en otras zonas
- Pocos trabajan en las estancias como encargados.
- Están los que trabajan por jornal y se dedican a hacer alambrado o limpieza de terreno en las estancias; pero no se da de manera frecuente.
- Agricultura para consumo; producción de mandioca, maní, caña de azúcar
- Ganadería en pequeña escala
- Cría de ganado menor
- Producción de leche, huevo, queso. Con algunos productos permutan por artículos en las despensas.
- Pequeños comercios; despensa y comercial



Vivienda



Situación del empleo: La venta de sombrero de Karanda'y se realiza a través de intermediarios o permutan a cambio de productos en las despensas de la zona. El desempleo es elevado y predomina el trabajo por jornal, pero no de forma sostenida.



Actividades recreativas

- **Fiesta patronal:** El 24 de junio, día de San Juan, se comparte con la comunidad y se realizan comidas tradicionales como el so'o hu'ú.
- **Club Hípico:** Carrera de caballo cada 15 días
- **Torneo de fútbol:** En las comunidades de Potrero Tacuara, Anderi, Calle 12, isla Tuyu, Cuartelero
- **Actividad de Pesca:** En el río Aquidabán



Medios de comunicación

- **Radio:** Récord de Arroyito y Radio Regional de Concepción
- **TV:** por antena principalmente.
- **Celular:** no cuentan con cobertura.



Organizaciones / Asociaciones

- Comisión vecinal
- Comisión de agua potable
- Comisión de iglesia pro festejo
- Equipo de Gestión Institucional Educativa EGIE
- Comisión de deporte



Principales problemáticas económicas, sociales y culturales

- Faltan fuentes de trabajo.
- Falta mercado seguro para comercialización de productos artesanales.
- Falta mejorar los caminos vecinales.
- Abigeato



Aspectos necesarios para un mayor desarrollo

- Mejorar los caminos vecinales
- Instalar un sistema de abastecimiento de agua potable en la zona



Acceso a servicios básicos

- **Agua potable:** Cuentan con pozo artesiano desde hace cinco meses. Se gestionó a través de la Gobernación. El agua es tratada con cloro.
- **Red de desagüe:** No se cuenta con red de desagüe en la comunidad.
- **Pozo-Letrina:** La mayoría de las viviendas aún tiene letrina en las viviendas. Aproximadamente siete viviendas con pozo ciego.
- **Medio de transporte:** El medio de transporte principal es la motocicleta. En la zona no cuentan con ómnibus, tienen que salir hasta calle 12 para disponer del servicio.
- **Tratamiento de basura:** No se cuenta con servicio de recolección de basura. En mayor porcentaje depositan en hoyos.
- **Energía eléctrica:** Proveída por la ANDE, desde 1999.



Instituciones y sitios de interés



Esc. Básica 4335



Hípico-Domínguez Nigó



Sistema de agua



Capilla María Auxiliadora



USF- Cuartelero



Iglesia Evangélica Filadelfia



Oratorio San Juan Bautista



Isla Hermosa



Información general

Zona: Rural

Distancia del centro urbano: A unos 80 km de la ciudad de Concepción (Loreto- Paso Barreto)

Municipio del cual depende: Paso Barreto

División del territorio: La Palma, San Pedro, San Miguel y Barrio Centro

Límites: Jhugua Ñandú, Ruta Paso Barreto- Loreto, Paso Mbutu, Domínguez Nigó, río Aquidabán

Principales vías de acceso: Ruta Paso Barreto- Loreto, Cruce Calle 14 - Cruce Calle 15, Paso Mbutu -Jhugua Ñandú, Dominguez Nigó

Habitantes: 700 personas

Cantidad de familias/viviendas: Alrededor de 160 viviendas

Comunidades indígenas: No hay comunidades indígenas en la zona.



Aspectos históricos

Isla Tuyu, como era conocida anteriormente tiene alrededor de 170 años.

Empezó a poblarse en el año 1850. Los primeros pobladores eran de apellido; Giménez, Silva, Núñez, De León, Escobar, Báez, Vargas.

La escuela se construyó en 1913 y el primer profesor era de apellido Silva.



Entre los aspectos positivos se señalan: la gente, es una comunidad unida, se destaca la tranquilidad, la naturaleza, y la seguridad de la zona.



Principales actividades económicas

- Pequeña ganadería para consumo; en algunos casos producen queso y venden.
- En menor medida trabajan en la chacra, ya que la tierra no es apta para cultivo.
- Los hombres trabajan en las estancias del Chaco a la edad de 12 o 13 años.
- Las jóvenes migran a Asunción, Concepción, Pedro Juan; España o Argentina.
- Alrededor de 80 familias se dedican a la elaboración y venta de sombreros de Karanda'y.
- Algunos trabajan en el frigorífico, y por lo general son jornaleros ("pordiasero").
- Otros son funcionarios públicos en las instituciones de la zona (salud, educación).



Elaboración de sombrero de Karanda'y



Comité Brazos Unidos del sombrero de Karanda'y



Situación del empleo: Existen muy pocas fuentes de trabajo en la comunidad y un alto porcentaje de desempleo. La situación se complejiza teniendo en cuenta que varias personas regresan del Chaco debido a que la oferta de trabajo disminuyó durante la pandemia. La gran mayoría trabaja por jornal haciendo changas y una gran cantidad de personas migra a otras ciudades y ya no regresa.

En la comunidad se dedican principalmente a la agricultura y ganadería en pequeña escala para autoconsumo. Mencionan que las personas que se emplean en el frigorífico ganan más, pero las condiciones laborales no son óptimas, se habla de un sistema de explotación debido a la carga horaria alta y la falta de estabilidad laboral.



Actividades recreativas

- **Fiesta patronal:** San Pedro, el 29 de junio y San Miguel el 29 de septiembre. Para la celebración se organiza desfile, lotería y fiesta.
- **Club Hípico:** Se realiza carrera de caballo.
- **Deporte:** Torneos de fútbol "femenino y masculino". Los hombres participan de competencias que se organizan en Paso Mbutu, Jhugua Ñandu, Horqueta y Paso Barreto. También se realizan torneos de vóley.
- **Desde la USF:** Se organiza caminatas y participan de la actividad los adultos mayores y los niños.
- **En las escuelas:** Se celebra el Día del Niño, día de la juventud, torneo interescolar e interclase.



Medios de comunicación

- **Radio:** Cristal FM 95.6 (Arroyito)
- **TV:** por antena principalmente.
- **Celular:** Se cuenta, pero la señal de internet en la zona no es buena.



Organizaciones / Asociaciones

- Comisión vecinal
- Comisión de Iglesia (2)
- Asociación de Cooperación Escolar
- Comité de Mujeres Brazos Unidos del Sombrero de Karanda'y (dejaron de activar durante la pandemia)
- Grupo juvenil de la iglesia



Principales problemáticas económicas, sociales y culturales

- Faltan fuentes de trabajo.
- Pobreza
- Falta de oportunidades, especialmente para los jóvenes
- Migración y desarraigo
- Deficiencia en la educación impartida en las escuelas
- Disminución de la población joven



Aspectos necesarios para un mayor desarrollo

- Brindar educación de calidad.
- Apoyo a la producción campesina, asistencia técnica sostenida y estrategias de comercialización.
- Fuentes de trabajo, especialmente para los jóvenes.
- Mejorar la infraestructura, equipamiento de salud.
- Una antena repetidora de internet.

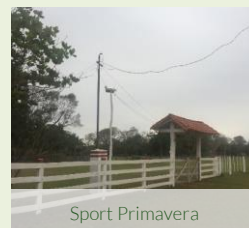


Acceso a servicios básicos

- **Agua potable:** Cuentan con red de abastecimiento de agua gestionada a través de SENASA; desde hace 10 años.
- **Red de desagüe:** No se cuenta con red de desagüe en la comunidad.
- **Pozo-Letrina:** El 2% de las viviendas posee baño con pozo ciego, los demás cuentan con letrina.
- **Medio de transporte:** El medio de transporte principal es la motocicleta. En la zona cuentan con servicio de ómnibus (privado) desde la ruta Loreto-Paso Barreto: Paso Barreto – Concepción, y Puentesño - Concepción.
- **Tratamiento de basura:** No se cuenta con servicio de recolección de basura. En mayor porcentaje queman y una población menor deposita en hoyos.
- **Energía eléctrica:** Proveída por la ANDE desde hace 13 años. La instalación es muy precaria, hay muchos cortes de energía eléctrica. Para mantenimiento de sistema vienen funcionarios de Paso Barreto o Jhugua Ñandu.



Instituciones y sitios de interés





Paso Mbutu



Información general

Zona: Rural

Distancia del centro urbano: A unos 84 km de la ciudad de Concepción (Ruta V- Calle 15)

Municipio del cual depende: Horqueta

División del territorio: Paso Mbutu

Límites: Arroyito, Col. Jorge Sebastián Miranda., Estribo de Plata, Domínguez Nigó, Paso Senda, Calle 15-Horqueta, Calle 15- Arroyito

Principales vías de acceso: Calle 15, Calle 14, Jhugua Ñandu, Paso Barreto y Puentesíño

Habitantes: 500, aproximadamente

Cantidad de familias/viviendas: Alrededor de 120 familias

Comunidades indígenas: No hay comunidades indígenas en la zona.



Aspectos históricos

Cuentan que Paso Mbutu es más antigua que la ciudad de Horqueta; pero no hay escrituras que lo demuestren. Mencionan que desde la época de los López empezó a poblarse el lugar.

En los inicios sólo existían tres casas que servían de depósito de yerba mate, de Tropa 40; de ahí se trasladaba el cargamento hasta Concepción. El nombre se vincula a dos aspectos: Mbutu por el insecto; y, porque era un lugar de “paso” para transportar yerba mate, de Pedro Juan Caballero a Concepción, con tropas que se trasladaban en carretas.

Entre los primeros pobladores se encuentran: los Soria, Pianderi, Peña y Regunega.

✓ **Entre los aspectos positivos se señalan:** la tranquilidad, las costumbres y tradiciones, el río, la plaza y la naturaleza. Se menciona además que es una comunidad bastante unida y solidaria.



Principales actividades económicas

- Agricultura principalmente para consumo (mandioca, poroto, maíz). Alrededor de unas 20 familias tienen huertas.
- Algunos se dedican a la producción de banana; y otros producen pastizales para los ganaderos de la zona.
- Ganadería en pequeña y gran escala
- Hay personas que se dedican a la venta de leche.
- Producción de sombrero de Karanda'y y tarrafa. Hay compradores que llegan a la comunidad y luego venden en otras zonas.
- Funcionarios de instituciones públicas existentes en la zona (USF, escuela, registro civil y policía)
- Pesca para consumo y venta
- Actividades de caza para consumo
- Trabajo por jornal en las estancias cercanas y del Chaco: hacen limpieza de terreno, alambrado, fabricación de postes. Acuerdan una cantidad de hectáreas para trabajar. Son en su mayoría varones los que se dedican y también familias.
- Las mujeres se dedican a la venta ambulante de comidas dulces y saladas, hacen limpieza y lavan ropa.
- También hay pequeños comercios como: despensas, comedores, puesto de venta de combustible y taller mecánico.



Situación del empleo: Hay mucho desempleo. La mayoría realiza changas por jornal. Los adolescentes empiezan a trabajar al terminar el 9no grado. Como consecuencia del desempleo hay migración al Chaco, a Pedro Juan Caballero o Asunción; y en algunos casos a España o Argentina.



Actividades recreativas

- **Fiesta patronal:** El santo Patrono es San José, se celebra el 1 de mayo. Además, se realizan otras celebraciones como: el día de María Auxiliadora, el 24 de mayo; Santa Rosa, el 30 de agosto. Deportes: laceada, carrera de caballo, vóley, torneos de fútbol.
- **Otras Actividades:** Playa, pesca y fiestas en el río Aquidabán; principalmente en la época de Navidad o Año Nuevo donde se reúnen personas de las localidades de Horqueta, Arroyito, Jhugua Ñandu.
- **En la escuela** se celebra además el día del niño y de la juventud y el día del Folclore.
- **Desde la USF:** Se realizan club de hipertensos y diabéticos, madres PANI y adultos mayores.



Medios de comunicación

- **Radio:** Cristal 96.5 y radio comunitaria 102.5 (Arroyito), Guyra Campana (Horqueta), Regional (Concepción)
- **TV:** Telefuturo, SNT, y por antena
- **Celular:** La principal forma de comunicación es a través de WhatsApp, pero en la zona no hay buena señal.



Organizaciones / Asociaciones

- Comisión vecinal
- Comisión de Pescadores de Paso Mbutu (en formación)
- Asociación de Cooperadora Escolar (ACE)
- Consejo de Salud
- Comisión de Agua
- Comisión de iglesia laicos
- Liga de fútbol Sport Paso Mbutu
- Escuela de fútbol



Principales problemáticas económicas, sociales y culturales

- Pobreza
- Faltan fuentes de trabajo en la comunidad.
- Trabajos esporádicos y precarizados
- Migración y desarraigo
- Problemas de abastecimiento de agua potable (la misma es salada)
- Faltan universidades públicas en la zona.
- Inundación



Aspectos necesarios para un mayor desarrollo

- Red de abastecimiento de agua potable para la comunidad
- Fuentes de trabajo
- Centros de formación (Universidad Pública, mandos medios)
- Invertir y desarrollar el turismo. Infraestructura para potenciar la playa. Un parador comunitario para vender los productos
- Mejorar los caminos vecinales
- Formación y fortalecimiento de comité productivos locales
- Apoyo a los productores de la zona por parte del gobierno local



Acceso a servicios básicos

- **Agua potable:** La comunidad no dispone de un sistema de red de agua potable. Utilizan pozo para uso cotidiano y para beber se abastecen de la naciente a la que denominan Yvu o Chorro. También utilizan agua de lluvia.
- **Red de desagüe:** No se cuenta con red de desagüe en la comunidad.
- **Pozo-Letrina:** La mayoría de los hogares tienen letrinas, y en menor porcentaje pozo ciego.
- **Medio de transporte:** El medio de transporte principal es la motocicleta. En la zona cuentan con servicio de ómnibus (privado): Jhugua Ñandu-Concepción, y Puentesño- Concepción (día de por medio).
- **Tratamiento de basura:** No se cuenta con servicio de recolección de basura. En mayor porcentaje queman.
- **Energía eléctrica:** Proveída por la ANDE.



Instituciones y sitios de interés





Estribo de Plata



Información general

Zona: Rural

Distancia del centro urbano: A unos 88 km de la ciudad de (Ruta V- Calle 15)

Municipio del cual depende: Paso Barreto

División del territorio: Estribo de Plata

Límites: Paso Mbutu, Colonia Jorge, Sebastián Miranda, Estancia La Blanca

Principales vías de acceso: Calle 15 - Paso Mbutu, Colonia Jorge Sebastián Miranda

Habitantes: 50 personas

Cantidad de familias/viviendas: Alrededor de 17 viviendas

Comunidades indígenas: No hay comunidades indígenas en la zona.



Aspectos históricos

La comunidad empezó a poblarse antes de 1904; tiene al menos unos 100 años de antigüedad. Cuentan que el nombre se debe a que durante el periodo de los López se utilizaban estribos de plata para montar a caballo. Los primeros pobladores eran de apellido Pereira.

Antes había en la comunidad unas 33 viviendas; pero muchos migraron a la Colonia Jorge Sebastián Miranda.



Entre los aspectos positivos se señalan: la tranquilidad, la libertad, la naturaleza, la tierra y el río.



Principales actividades económicas

- Se dedican a la ganadería principalmente, para autoconsumo y venta según necesidad cada 15 o 22 días.
- Agricultura; producen principalmente mandioca, ya que la tierra no es apta para cultivar.
- Cría y venta de ganado menor (gallina principalmente)
- En algunos hogares se produce queso para la venta.
- Los varones van a trabajar al Chaco y las mujeres principalmente a España o Argentina.



Situación del empleo: No hay fuentes de trabajo en la comunidad, la gente migra en busca de mayores oportunidades. El rubro principal es la ganadería para consumo.



Actividades recreativas

- **Fiesta patronal:** El 8 de diciembre, día de la Virgen de Caacupé, se celebra con una misa, un festival y un "karu guasu" para compartir entre los pobladores de la comunidad.
- **Hípico:** Se organizan carreras de caballo.



Medios de comunicación

- **Radio:** Cristal FM-Aroyito
- **TV:** Telefuturo, SNT, y por antena
- **Celular:** La mayoría tiene acceso a internet. La principal forma de comunicación es a través de WhatsApp.



Organizaciones / Asociaciones

- Comisión vecinal



Principales problemáticas económicas, sociales y culturales

- Falta de fuentes de trabajo en la comunidad
- Inseguridad, asaltos
- Falta apoyo a la producción campesina, asistencia técnica, capacitación, fortalecimiento y canales de comercialización a precios justos.
- Abigeato



Aspectos necesarios para un mayor desarrollo

- Tener un rubro de exportación como el tártago
- Mercado seguro y precios justos de venta
- Apoyo del gobierno y asistencia técnica sostenida para la producción campesina



Acceso a servicios básicos

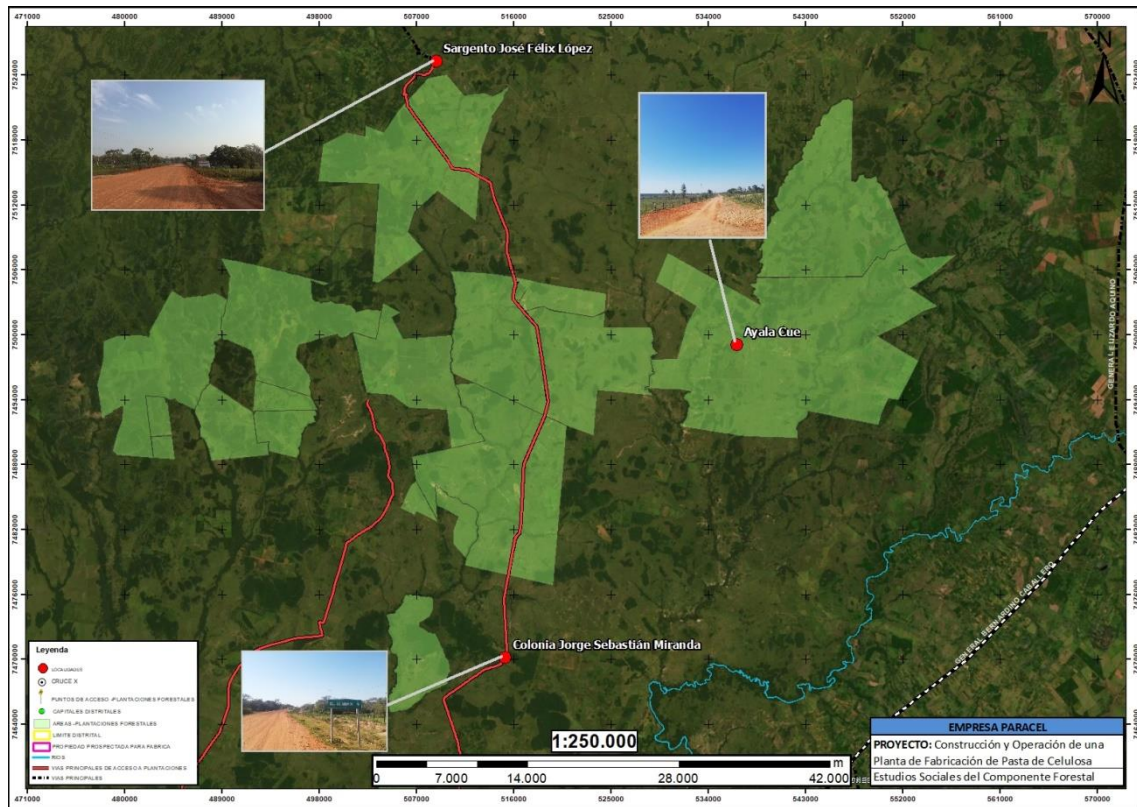
- **Agua potable:** La comunidad no cuenta con sistema de abastecimiento de agua potable. La mayoría de los hogares posee pozos; 2 de las viviendas de la zona no cuentan con pozo y se abastecen de los vecinos más próximos.
- **Red de desagüe:** No se cuenta con red de desagüe en la comunidad.
- **Pozo-Letrina:** La mayoría de las viviendas tienen letrinas, solo 5 cuentan con baños con pozo ciego en la comunidad.
- **Medio de transporte:** El medio de transporte principal es la motocicleta y caballo. En la zona cuentan con servicio de ómnibus (privado) tres veces por semana. (Horarios: para ir a Concepción a las 5:15 AM, para regresar sobre la Ruta V Pasa a las 15:00 PM): Puentesíño - Concepción, y Jhugua Ñandu - Concepción.
- **Tratamiento de basura:** No se cuenta con servicio de recolección de basura. En mayor porcentaje queman y tiran en hoyos.
- **Energía eléctrica:** Proveída por la ANDE. Hay una vivienda sin conexión eléctrica. Hay cortes frecuentes de energía eléctrica en la zona.



Instituciones y sitios de interés



Mapa Acceso Calle 15 (Zona Norte)



En dirección al Norte, siguiendo el acceso de Calle 15, se encuentran las comunidades de Colonia Jorge Sebastián Miranda, Sargento José Félix López y Ayala Cue.

Para llegar a la comunidad de Ayala Cue por esta vía, se debe ingresar unos 20 km en dirección al distrito de Bella Vista Norte por un camino de servidumbre de paso localizado al margen derecho de la ruta, en el distrito de Sargento José Félix López.



Jorge Sebastián Miranda



Información general

Zona: Rural

Distancia del centro urbano: A unos 101, 85 km de la ciudad de Concepción (Loreto-Paso Barreto)

Municipio del cual depende: Paso Barreto

División del territorio: Cerrito, San Antonio, San Juan, San Isidro, San

Sebastián, Alegría y Las Mercedes y La Esperanza (en proceso de aprobación)

Límites: Estancia Trementina - Puentesíño, Paso Barreto

Principales vías de acceso: Calle 15 - Paso Mbutu, Puentesíño, Paso Barreto

Habitantes: 1300 personas, aprox.

Cantidad de familias/viviendas: No mencionan

Comunidades indígenas:

Jeguahaty: situada en la estancia Aguerito (55 familias aproximadamente)

Vy'arenda Boquerón: camino a Puentesíño (45 familias aproximadamente)



Aspectos históricos

No mencionan con exactitud el año de origen de la comunidad, cuentan que desde antes de 1950 ya había pobladores en la zona. Lleva el nombre de Jorge Sebastián Miranda en homenaje a un profesor horqueteño que falleció. Pero la comunidad es más conocida como Jhugua Ñandu; el nombre se debe a que anteriormente había una zona de estancias conocida como Jhugua donde había muchos avestruces.

Entre los aspectos positivos se señalan: la tierra, la tranquilidad, la gente es trabajadora con deseos de estudiar y superarse.



Principales actividades económicas

- Aproximadamente el 15% se dedica a la producción agrícola. Se cultiva sésamo, mandioca y maíz para consumo. El sésamo y el zapallo son rubros de renta. Actualmente hay más producción hortícola; principalmente tomate, sandía y banana.
- La mayoría se dedica a la ganadería en pequeña escala. Se produce leche y queso para consumo y también para venta.
- Algunos hombres trabajan en las estancias del Chaco, por jornal o por trato (subcontratados), o con sueldo fijo. En algunos casos van a las estancias acompañados de sus esposas para trabajar; éstas son encargadas de las cocinas. Otros son "jornaleros" en las estancias cercanas.
- Un gran porcentaje trabaja por jornal diario (changas) en rubros como la construcción (albañilería).
- Las mujeres en su mayoría son amas de casas o poseen pequeños negocios como despensa, decoración, alquiler de sillas. Las que son estudiantes siguen formándose y trabajando en las ciudades.
- Algunos son funcionarios públicos (salud, educación).



Situación del empleo: Se estima que el porcentaje de desempleo es del 30%. La mayoría trabaja haciendo changas. No muchos se dedican a la agricultura debido a la falta de caminos y la dificultad para trasladar la producción; los que se dedican al rubro comercializan a través de intermediarios en la zona. La población joven se traslada a las ciudades para emplearse/ estudiar; pero muchos dejan sus estudios para trabajar y ayudar a sus familias.

Taller mecánico



Actividades recreativas

- **Fiesta patronal:** Se organiza por barrio y se involucra toda la comunidad. Se mencionan: San Sebastián, el 20 de enero; San Juan Bautista, el 24 de junio; Las Mercedes, el 24 de septiembre.
- **Deportes:** Torneo de fútbol y vóley (mujeres y hombres)
- **Laceada:** Se organizan torneos; pero oficialmente una vez al año a través de la asociación.
- **Otras celebraciones:** En el mes de agosto se celebra la independencia del área educativa (anteriormente el área educativa dependía de la ciudad de Loreto).
- **Los colegios y las escuelas** realizan festivales y campeonatos interescolares, celebran el Día del Niño y el Día de la Juventud.



Medios de comunicación

- **Radio:** Cristal (Arroyito), Regional (Concepción)
- **TV:** Por antena. Por canal de aire SNT, Telefuturo y Canal 13
- **Celular:** La mayoría tiene acceso a internet. La principal forma de comunicación es a través de WhatsApp. Durante la pandemia se activó un grupo para informes con los pobladores y referentes de instituciones.



Organizaciones / Asociaciones

- Asociación de vecinos
- Comisión vecinal: Barrios Alegría y San Isidro
- Comité de producción agrícola (2)
- Comisión de Iglesia (Las Mercedes y San Juan)
- Tienen grupo juvenil para organizar la fiesta patronal
- Asociación de Cooperadoras Escolares



Principales problemáticas económicas, sociales y culturales

- Pobreza
- Faltan fuentes de trabajo en la comunidad.
- Falta apoyo a la producción campesina, asistencia técnica sostenida.
- Mercado seguro para la producción y canales para comercialización a precios justos de venta
- Deserción escolar asociada a la necesidad de emplearse a temprana edad



Aspectos necesarios para un mayor desarrollo

- Capacitación y asistencia técnica sostenida a productores
- Apoyo a la producción campesina; mercado seguro para comercialización a precios justos de venta
- Aumentar el stock de insumos y medicamentos de la USF
- Instalar universidades públicas en la zona



Acceso a servicios básicos

- **Agua potable:** La comunidad cuenta con 5 tanques. Algunos instalados a través de SENASA y otros vía gobernación. El mantenimiento es responsabilidad de la comisión de agua. Hay una comunidad que se abastece del río Aquidabán, pozo común o arroyos cercanos.
- **Red de desagüe:** No se cuenta con red de desagüe en la comunidad.
- **Pozo-Letrina:** El 45 % de las viviendas tiene baño con pozo ciego. La mayoría posee letrinas en sus hogares.
- **Medio de transporte:** El medio de transporte principal es la motocicleta. En la zona cuentan con servicio de ómnibus (privado): Puentesño - Concepción, y Jhugua Ñandu - Concepción.
- **Tratamiento de basura:** No se cuenta con servicio de recolección de basura. Los residuos se queman y se tiran en el hoyo.
- **Energía eléctrica:** Proveída por la ANDE. Aproximadamente desde el año 1999 se cuenta con energía eléctrica en la zona. Hay una comunidad indígena que no tiene luz eléctrica.



Instituciones y sitios de interés



Capilla San Juan



Colegio Nacional Dominga Ocariz de Samaniego



USF-Colegio Jorge Sebastián Miranda



Sistema de agua



Esc. Básica N° 14469 Virgen de las Mercedes



Oratorio San Sebastián



FTC



Subcomisaría 27 Col. Miranda



Esc. Básica N° 3229 San Juan Bautista



Sargento José Félix López



Información general

Zona: Rural

Distancia del centro urbano: A unos 180 km de la ciudad de Concepción (Ruta V-Calle 15)

Municipio del cual depende: Loreto

División del territorio: San Clemente, Santa Ana, Piri Poty, La Suerte, Yvyte, Loma Pytã, Unión

Límites: San Carlos del Apa, Bella Vista Norte, Col. Jorge Sebastián Miranda. Alrededor de la zona urbana hay asentamientos y estancias

Principales vías de acceso: Calle 15, Bella Vista, Paso Barreto - Jhugua Ñandu, San Carlos del Apa

Habitantes: 2887 personas

Cantidad de familias/viviendas: Alrededor de 861 familias

Comunidades indígenas:

Takuarita: cuenta con 189 habitantes, aproximadamente; viven de la agricultura, la caza y la pesca.

La Esc. Básica N° 6292 Takuarita posee alrededor de 96 estudiantes.

Reciben asistencia médica por parte de la USF de Sargento José Félix López una vez al mes.



Aspectos históricos

Los pobladores mencionan que después de la Guerra del 70 empezó a conformarse la comunidad. Fue tierra de excombatientes de la Guerra Grande.

Puentesño, es la capital del distrito. Algunos mencionan que su nombre se vincula al hecho de que antiguamente había brasileros que se dedicaban a la macatería; uno de ellos falleció bajo un puente y por ende empezaron a denominar a la zona como "Puentesño".

José Félix López, en honor al hijo de Juanita Pesoa y el Mariscal López que combatió y murió en la Guerra Guasu.

Entre los apellidos más antiguos se señalan: Antebi, Ojeda, Sánchez, Pereira. La comunidad se conformó con pobladores provenientes principalmente de Horqueta, Tacuati y Brasil.

✓ **Entre los aspectos positivos se señalan:** la tranquilidad, la naturaleza y los recursos naturales (hay bosques nativos, tierra fértil, el río y el Arroyo Amambay que corre en sentido contrario al río Apa), no hay contaminación en la zona, las personas producen para satisfacer sus necesidades de consumo, hay solidaridad y se conocen entre los miembros de la comunidad.



Principales actividades económicas

- Agricultura. Cultivo de maíz y sésamo para venta; el maíz tupi pytã se vende a una estancia de la zona para alimento de animales; también hay huertas y chacra para consumo (maní, zapallo, mandioca, batata).
- Producción ganadera en pequeña y gran escala
- Cría de ganado menor.
- Pesca para consumo y venta
- En las estancias están quienes trabajan como jornaleros o como encargados "peones".
- Explotación de madera: Tajy, Yvyra Pytã, Urundeymi y Moreysyvo.
- Empleados del Estado (docentes, salud y otras instituciones públicas de la zona)
- Pocas mujeres son empleadas domésticas, mayormente son amas de casa y no reciben remuneración; algunas trabajan en las estancias.
- Hay personas que se dedican a la venta de minutas. En la zona también producen carbón.
- Hay comercios tales como: despensa, comercial, taller de motocicletas y automóviles, copetín, comedores, carpintería, ferretería, auto repuestos y aserraderos. También cuentan con servicio de hospedaje, peluquería, servicio de minicarga y reparación de celulares.



Situación del empleo: Se menciona el desempleo, la falta de fuentes de trabajo en la zona que garanticen la estabilidad, seguridad laboral y remuneración acorde a los trabajos que se realizan.

Muchos migran al terminar el bachillerato o antes para trabajar. Van a las ciudades de Concepción Pedro Juan Caballero.

Un gran porcentaje se dedica a realizar trabajos esporádicos a cambio de un jornal diario que varía dependiendo de la actividad que se les solicite.



Actividades recreativas

- **Fiesta patronal:** El día de San Pedro y San Pablo se celebra el 29 de junio.
- **Deportes:** Organizan torneo de piqui vóley y fútbol. Tienen liga de fútbol (liga senior y liga femenina).
- **Carrera de caballos:** En el hípico local se organizan eventos a los cuales acuden pobladores de otras localidades.
- **Aniversario de distritación:** Se celebra el 7 de septiembre; se realizan festivales, novenarios, elección de miss, jineteada, serenata y desfile estudiantil durante la semana de aniversario.
- **En las escuelas** se organizan olimpiadas educativas interescolares. Además, se realiza el festival de la carreta, del Karai Octubre y del trébol.
- **Festival Paso Bravo:** en la fecha se realizan desfiles estudiantiles y participan referentes artísticos de Arroyito, Belén, San Carlos del Apa.
- **Festival del Arroyo Itaky,** se celebra el 7 de septiembre.
- **Actividades que se realizan desde la USF:** Se organizan charlas dirigidas a la población de adultos mayores, club de embarazadas, club de padres, entre otros.



Medios de comunicación

- **Radio:** Itaky FM 98.8, Radio Activa, Radio Más 98.5, Radio Evangélica Pregonero FM 96.5, y Sendero Luz del Cielo
- **TV:** Por antena. Por canal de aire SNT, Telefuturo y Canal 13
- **Celular:** La mayoría tiene acceso a internet. La principal forma de comunicación es a través de WhatsApp.



Organizaciones / Asociaciones

- Comisiones vecinales
- Comité de iglesias –Grupos Juveniles
- Comisión de deportes
- Asociación de Cooperadoras Escolares (ACE)
- Equipo de Gestión de Instituciones Educativas (EGIE)
- Comité 29 de Junio Jaiko Poravê Rekávo
- Asociación Campesina Norte Pyahu
- Asociación de Comerciantes



Principales problemáticas económicas, sociales y culturales

- Faltan fuentes de trabajo en la comunidad; principalmente para jóvenes.
- Trabajo informal precarizado
- Falta apoyo a la producción campesina, asistencia técnica, capacitación, fortalecimiento y generación de canales de comercialización adecuados.
- Falta infraestructura de salud acorde a las necesidades de la zona.
- Falta mejorar los caminos.
- Existen problemas de abastecimiento de agua en los asentamientos
- Se registra un aumento de casos de trabajo sexual.
- Embarazo precoz
- Se registran casos de adolescentes en situación de consumo de drogas.
- Migración y desarraigo
- Faltan centros y universidades que garanticen la formación terciaria.



Aspectos necesarios para un mayor desarrollo

- Acceder a capacitaciones y oportunidades laborales
- Fortalecer la agricultura familiar campesina y los canales de comercialización de productos
- Mejorar los caminos existentes a fin de comercializar en otras zonas
- Construcción de parques y plazas
- USF ampliada, con infraestructura adecuada para atención



Acceso a servicios básicos

- **Agua potable:** La comunidad posee al menos 10 Juntas de Saneamiento. Además, cuentan pozos de agua y tajamares particulares. Hay comunidades que tienen problemas de abastecimiento de agua.
- **Red de desagüe:** No se cuenta con red de desagüe en la comunidad.
- **Pozo-Letrina:** 93 Viviendas aún cuentan con letrinas; las demás poseen pozo ciego con cámara séptica. En los asentamientos predominan las viviendas con letrinas.
- **Medio de transporte:** El medio de transporte principal es la motocicleta. En la zona cuentan con servicio de ómnibus (privado). Empresa Yeruti y Estrella del Norte provenientes de Pedro Juan, una empresa de Bella Vista, empresa Águila de Concepción.
- **Tratamiento de basura:** No se cuenta con servicio de recolección de basura. Los residuos por lo general se queman o se tiran en hoyos. Hay un terreno baldío en el barrio Loma Pytâ sirve como vertedero de la zona; donde la gente que tiene medios deposita su basura.
- **Energía eléctrica:** Proveída por la ANDE.



Instituciones y sitios de interés





Ayala Cue



Información general

Zona: Rural

Distancia del centro urbano: A unos 172 km de la ciudad de Concepción (Ruta V-Calle 15)

Municipio del cual depende: Bella Vista Norte

División del territorio: Ayala Cue

Límites: Casualidad, Estancia Santa Teresa, Estancia Zapallo, Estancia Errante

Principales vías de acceso: Cruce Bella Vista, Puentesño por camino de estancias

Habitantes: No menciona

Cantidad de familias/viviendas: Alrededor de 130 familias

Comunidades indígenas: No hay comunidades indígenas en la zona.



Aspectos históricos

Desde 1950 ya había población asentada en Ayala Cue; pero se desconoce la fecha en que empezó a conformarse la comunidad.

Los primeros pobladores eran de apellido Ayala; después vinieron los Mendoza. Como inicialmente fue tierra exclusiva de los Ayala, en la actualidad, se la conoce como Ayala Cue ya que los terrenos pasaron a ser también propiedad de otras familias.

Los primeros pobladores de la zona fueron los de apellido Ayala y Mendoza.

Entre los aspectos positivos se señalan: tranquilidad, la unidad, la no discriminación, el diálogo. Se menciona además que la Estancia aporta a la comunidad en materia de salud.



Principales actividades económicas

- Se dedican a la agricultura para consumo (poroto, maíz, mandioca). La mayoría tiene chacra y huerta.
- Las mujeres son amas de casa y algunas migran a Concepción, Bella Vista Norte y Pedro Juan Caballero para trabajar y estudiar; y otras venden comestibles en la zona.
- Algunos varones trabajan en la estancia Santa Teresa como encargados "peones"; los jóvenes trabajan en los retiros.
- Existen pequeñas despensas en la comunidad.
- Unas cinco personas son funcionarios del Estado y trabajan en las escuelas de la zona.



Fuente: <https://m.facebook.com/Escuela-Basica-3990-Santa-Teresa-994509710629099/photos/1017546474992089/>



Situación del empleo: Hay desempleo en la zona, por lo general realizan changas esporádicas y reciben un pago entre quince y veinte mil guaraníes.



Actividades recreativas

- **Fiesta patronal:** El 15 de octubre se conmemora el día de Santa Teresita, se celebra con misa, procesión, números artísticos y una gran comida que se comparte en la Estancia Santa Teresa.
- **Deportes:** Torneo de fútbol y vóley
- **Actividades organizadas en las escuelas:** Se celebra el Día del Niño y el Día de la Juventud, la fiesta de San Juan. Se organiza bingo y torneos de fútbol con los estudiantes y se comparte con los padres y los demás miembros de la comunidad.



Medios de comunicación

- Radio cristiana
- **TV:** Telefuturo por antena
- **Celular:** no hay buena señal en la zona.



Organizaciones / Asociaciones

- Asociación de Cooperadora Escolar (ACE)



Principales problemáticas económicas, sociales y culturales

- Pobreza y desigualdad
- Faltan fuentes de trabajo en la comunidad.
- Trabajos esporádicos y precarizados
- Falta una unidad de salud familiar para atención médica.
- Falta un puesto policial en la zona.



Aspectos necesarios para un mayor desarrollo

- Acceder a capacitaciones y oportunidades laborales
- En materia de seguridad es necesaria la instalación de un puesto policial en la comunidad.
- Se requiere la instalación de una USF en la zona.



Acceso a servicios básicos

- **Agua potable:** La comunidad cuenta con un pozo que abastece a la comunidad. Se gestionó a través de la gobernación de Amambay.
- **Red de desagüe:** No se cuenta con red de desagüe en la comunidad.
- **Pozo-Letrina:** La mayoría de las viviendas tienen letrinas.
- **Medio de transporte:** El medio de transporte principal es la motocicleta. En la zona cuentan con servicio de ómnibus (privado): Empresa Yeruti que va a Puentesíño.
- **Tratamiento de basura:** No se cuenta con servicio de recolección de basura, se quema y/o tiran en hoyos.
- **Energía eléctrica:** Proveída por la ANDE, desde hace unos 10 años aproximadamente.

ANEXO 5: INVENTARIO DE PROGRAMAS Y PROYECTOS AID-PARACEL

Inventario de Programas y proyectos en el AID.

A continuación, se presenta la gama de programas y proyectos identificados durante el proceso de elaboración de los estudios sociales. Estos divididos en tres grupos.

- Programas y proyectos identificados durante:
 - La elaboración de la caracterización socioeconómica de las zonas de influencia del proyecto.
 - La identificación de impactos acumulativos y
 - El relevamiento de la percepción de actores institucionales y referentes comunitarios.

Se tomaron en cuenta los registros de la etapa anterior; componente industrial, si bien se presentan programas y proyectos que tienen estrecha relación con los distritos incluidos en el AID del componente forestal, se consideró importante actualizar (donde fue posible) las informaciones respecto a dichas iniciativas.

1- Proyectos identificados durante la elaboración de la caracterización socio-económica de las zonas de influencia del proyecto.

Nro.	Proyecto/Programa	Institución	Descripción resumida	Alcance geográfico	Fechas de ejecución	Situación
1	Obras de acantarillado sanitario y la construcción de una planta de tratamiento de aguas residuales en un terreno cedido por el municipio.	MOPC, Municipalidad y Junta de Saneamiento San Antonio de la Ciudad de Horqueta.	Se avanza en el proceso para la construcción y tratamiento de aguas residuales, así como para el mejoramiento del sistema de agua potable para la ciudad.	Horqueta	Actualmente	En ejecución
2	Mejoramiento Caminos Vecinales en el departamento de Concepción	Ministerio de Obras Públicas y Comunicaciones	Mejoramiento de la transitabilidad de 37 Km de caminos vecinales en los siguientes tramos el tramo Loreto - Paso Barreto.	Departamento de Concepción.	2020 - 2025	En espera de ejecución

Nro.	Proyecto/Programa	Institución	Descripción resumida	Alcance geográfico	Fechas de ejecución	Situación
3	Construcción de Caminos Vecinales Pavimentados y no Pavimentados Departamento de Concepción	Ministerio de Obras Públicas y Comunicaciones	Contribuir al mejoramiento de la transitabilidad de tramos de Caminos Vecinales en el Departamento de Concepción. 35,480 Km de Construcción de Caminos Vecinales Pavimentados y no Pavimentados del tramo Retiro Alegre – Itacua; 25,679 Km de Construcción de Caminos Vecinales Pavimentados y no Pavimentados del tramo Horqueta - Jhugua Poi.	Departamento de Concepción.	2019 - 2020	En proceso
4	Mejoramiento Caminos - Departamento Concepción	Ministerio de Obras Públicas y Comunicaciones	Contribuir al mejoramiento de la transitabilidad de los caminos de los distritos de Loreto – Las Palmas-San Blas – Ruta 5 km. 18.2, tramo 14.1 de 15. del Departamento de Concepción. - 17.56 km de Pavimentación asfáltica del tramo Ruta 5 – Jhugua Ocampos – Ykya Jhovy – San Blás del Departamento de Concepción.	Departamento de Concepción.	2019 - 2020	En Proceso
5	Mejoramiento Sistema Eléctrico en el departamento de Concepción	Administración Nacional de Electricidad	Mejorar la calidad de vida de la población que habita en el área de influencia del proyecto, que abarca a los distritos de Concepción, Loreto, San Alfredo y Belén del departamento de Concepción, y el distrito de Pozo Colorado del departamento de Presidente Hayes, correspondiente al Sistema Norte mediante la construcción de LT simple terna en 220 kV entre SE Horqueta-SE Concepción I; 2) Construcción LT 66 kV entre SE Concepción II; SE Concepción I; 3) Construcción nueva Subestación (SE) Concepción II en 220 kV; 4) Ampliación de la SE Horqueta y; 5) Ampliación de la SE Concepción I.	Departamentos Concepción y Pte. Hayes	2020 - s/d	En proceso ¹

¹ Banco de Desarrollo de América Latina. Noviembre 2020. Disponible en : <https://www.caf.com/es/actualidad/noticias/2020/11/ande-firma-contrato-de-prestamo-por-usd-250-millones-con-caf-para-fortalecer-el-sector-electrico-nacional/>

Nro.	Proyecto/Programa	Institución	Descripción resumida	Alcance geográfico	Fechas de ejecución	Situación
6	Programa de Saneamiento y Agua Potable para el Chaco y Ciudades Intermedias de la Región Oriental del Paraguay	Ministerio de Obras Públicas y Comunicaciones	Construcción del Sistema de Alcantarillado Sanitario y Planta de Tratamiento de Efluente de la Ciudad de Horqueta.	Distrito de Horqueta.	2020 -	En ejecución
7	PPI Fase II - Proyecto Paraguay Inclusivo	Ministerio de Agricultura y Ganadería	Proyecto de inclusión de la agricultura familiar en cadenas de valor. Tiene como objetivo contribuir a incrementar los activos, los ingresos y calidad de vida de los agricultores familiares campesinos pobres y población rural pobre, mediante su inserción en forma sostenible, y a través de sus organizaciones sociales representativas, en Cadenas de Valor, con visión de género y conservación del medio ambiente.	Región Oriental del Paraguay; prioritariamente los Departamentos de Concepción, San Pedro, Guairá, Caaguazú, Caazapá, Itapúa, Paraguari, Misiones, Cordillera, Central y Canindeyú.	2019 - s/d	En ejecución
	"Gestión Organizativa Territorial para la protección ambiental y cultural de comunidades campesinas del distrito de Horqueta-Concepción". Con apoyo del Proyecto Bosques para el Crecimiento Sostenible	Ministerio del Ambiente y Desarrollo Sostenible (MADES), el PNUD y ejecutada por la OZAE.	El proyecto es implementado por la Organización Zonal de Agricultores Ecológicos (OZAE) del distrito de Horqueta del primer departamento de Concepción y se desarrolla en el marco de la iniciativa	Horqueta		En proceso

Nro.	Proyecto/Programa	Institución	Descripción resumida	Alcance geográfico	Fechas de ejecución	Situación
	Programa Cadenas de valor inclusivas	USAID-FECOPROD-CIRD	So objetivo principal es impulsar el desarrollo económico y social sostenible de unos 15.000 productores rurales de pequeña escala de la zona norte del país, mediante la promoción de cadenas de valor agropecuarias que presten especial atención a la inclusión activa de las mujeres, jóvenes e indígenas mediante acciones y estrategias que incorporen la sostenibilidad ambiental y la mitigación de los efectos adversos del cambio climático.	Concepción, Horqueta, Belén, Loreto y Yvy Ya'u		Final
9	PAGRO - Programa de Modernización de la Gestión Pública de Apoyos Agropecuarios.	Ministerio de Agricultura y Ganadería	Tiene como objetivo contribuir a la mejora de la productividad y el aumento de ingreso de los pequeños y medianos productores agropecuarios. El programa enfatiza fortalecer la agricultura familiar, para lograr la seguridad alimentaria e inserción a cadenas de valor a través del incremento de la cobertura de los servicios institucionales con calidad, enfoque territorial e inclusividad.	Concepción, Cordillera, Misiones, Paraguari, Caaguazú, Caazapá, Guaira, Central, Itapuá, San Pedro y Pte. Hayes.	s/d	Finalizado
	Fortalecimiento y desarrollo de micro-emprendedores FDM2	Itaipu y Unión Industrial Paraguaya (UIP)	Consiste en apoyo a través capacitaciones y la transferencia de fondos de inversión para microempresas.	Horqueta	-----	En ejecución
----		Directores municipales de Horqueta y de Concepción, con el apoyo de BASI IS-SERPAJ y la Red Rural	Mediante el cual se elabora una ordenanza municipal que declara a 7 comunidades horquetteñas como agroecológicas.	Horqueta	----	----

Nro.	Proyecto/Programa	Institución	Descripción resumida	Alcance geográfico	Fechas de ejecución	Situación
10	PRONAFOPE - Programa de Fomento de la Producción Pecuaria.	Ministerio de Agricultura y Ganadería	A través de aportes económicos y capacitación técnica busca promover el incremento de la producción y productividad de los productores familiares pecuarios, contribuyendo a la seguridad alimentaria y la generación de ingresos de los productores/as y sus familias.	Nacional	2009/s/d	En ejecución ²
	Proyecto “Mejorando la seguridad alimentaria y generando oportunidades económicas en el departamento de Concepción”	OCRC (Organización Campesina Regional de Concepción)	Se trabaja la agricultura sostenible, seguridad alimentaria y gestión de recursos ambientales. A través de este se brinda asistencia técnica a pequeños agricultores orgánicos y capacitación laboral y de liderazgo a jóvenes y mujeres, ayudando a mejorar la seguridad alimentaria y el potencial de generación de ingresos.	Departamento de concepción	2018-2021	En ejecución
11	PROMAFI - Proyecto de Mejoramiento de la Agricultura Familiar Campesina e Indígena en el Noreste del Paraguay	Ministerio de Agricultura y Ganadería	El objetivo del proyecto es incrementar de manera sostenible los ingresos de los hogares rurales pobres mediante el fortalecimiento organizacional, la mejora de la producción y el crédito procedente de instituciones financieras intermediarias.	Región Oriental del Paraguay.	2018 - s/d	En ejecución
12	RESIPROAF - Restauración de los Sistemas de Producción de la Agricultura Familiar a Nivel Nacional.	Ministerio de Agricultura y Ganadería	Tiene como objetivo dotar al productor agropecuario y sus familias de apoyos financieros, herramientas tecnológicas, infraestructura y servicios asociados, sirviendo de soporte para otros beneficios ya brindados por el MAG, logrando que los actuales sistemas de producción sean más óptimos, competitivos y modernos.	Nacional	2019 - s/d	En ejecución

² MAG- Twitter. Disponible en: <https://twitter.com/magparaguay/status/1319971092350586881>

Nro.	Proyecto/Programa	Institución	Descripción resumida	Alcance geográfico	Fechas de ejecución	Situación
14	Programa de Modernización y Mecanización de la Agricultura Familiar.	MAG-STP-ITAIPU- UNOPS	El proyecto tiene como objetivo promover el fortalecimiento de emprendimientos de producción agrícola orientados a la integración a los mercados, a cadenas de valores regionales, a través de servicios e insumos para consolidar la modernización tecnológica, el aumento de la productividad, la mejora de los ingresos de las familias en situación de pobreza y extrema pobreza en los asentamientos rurales promoviendo el fortalecimiento organizacional de familias agricultoras.	Concepción, San Pedro, Canindeyú, Caaguazú, Caazapá, y Alto Paraná.	2015 - s/d	En ejecución
15	Tekoporã - Programa de Transferencias Monetarias con Corresponsabilidad.	Ministerio de Desarrollo Social	TEKOPORÃ es un programa de transferencias condicionadas (PTC) que busca brindar protección social a hogares en situación de pobreza y mejorar la calidad de vida de sus participantes. Desde un comienzo el foco fue la facilitación del ejercicio de los derechos a alimentación, salud y educación. En la actualidad, se busca incorporar a personas con discapacidad severa en situación de pobreza y/o vulnerabilidad, así como también a comunidades indígenas.	Nacional	2005 - Indefinido	En ejecución
16	Programa Tenonderã	Ministerio de Desarrollo Social	Busca que las familias que van a egresar de Tekoporã puedan generar sus propios ingresos, sean estables económica y socialmente con alternativas de producción, a fin de que puedan salir y mantenerse fuera de la situación de pobreza. Este programa complementa el trabajo con las familias para una salida estructural y sostenida de su situación de pobreza.	Nacional	2014 - Indefinido	En ejecución

Nro.	Proyecto/Programa	Institución	Descripción resumida	Alcance geográfico	Fechas de ejecución	Situación
17	Programa de pensión alimentaria para adultos mayores en situación de pobreza.	Ministerio de Hacienda	Programa de pensión alimentaria consiste en la otorga a todas las personas mayores de 65 años que vivan en situación de pobreza un ingreso económico mensual para satisfacer sus necesidades básicas. Asimismo, también considera a los veteranos de la guerra del Chaco y sus herederos como beneficiarios, también a las familias de los militares y policías caídos en servicio activo.	Nacional	2009 - Indefinido	En ejecución
18	PAI - Programa Ampliado de Inmunizaciones.	Ministerio de Salud Pública y Bienestar Social	Tiene como objetivo la protección adecuada de la población contra enfermedades inmunoprevenibles, para lo cual se garantiza la adquisición y provisión gratuita y efectiva de las vacunas que forman parte del esquema regular de vacunación y de aquellas recomendadas por la OPS/OMS.	Nacional	2004 - Indefinido	En ejecución
19	PANI - Programa Alimentario Nutricional Integral.	Ministerio de Salud Pública y Bienestar Social	El objetivo del Programa es contribuir al mejoramiento de la calidad de vida de la población paraguaya. Posee un enfoque preventivo e integral, favoreciendo la recuperación nutricional de poblaciones vulnerables.	Nacional	2005 - Indefinido	En ejecución
20	PAEP - Programa de Alimentación Escolar del Paraguay.	Ministerio del Ministerio de Educación y Ciencias	Busca instalar una nueva cultura de alimentación saludable, con enfoque de derecho, priorizando los productos de la agricultura familiar y la formación en educación alimentaria nutricional de los estudiantes del sistema educativo.	Nacional	2014 - Indefinido	En ejecución
21	Abrazo - Programa Nacional para la Disminución del Trabajo Infantil	Ministerio de la Niñez y la Adolescencia	Programa nacional de transferencia condicionada para la disminución progresiva del trabajo infantil que suma los componentes de: calle, familia, centros y redes de protección.	Concepción, Amambay, Canindeyú, Alto Paraná, Caaguazú, Cordillera,	2005 - Indefinido	En ejecución

Nro.	Proyecto/Programa	Institución	Descripción resumida	Alcance geográfico	Fechas de ejecución	Situación
				Central, Guairá, Misiones, 21Itapúa.		
22	Programa Competitividad de las MIPYMES	Ministerio de Industria y Comercio	Busca que las micro, pequeñas y medianas empresas generen nuevos empleos, desarrollen productos innovadores y accedan a mercados importantes, incrementen sus ingresos para que de esta forma las empresas puedan ser más competitivas.	Nacional	2019 - s/d	En ejecución
23	Programa Mejora de las Capacidades Empresariales de las MIPYMES – PMCE.	Ministerio de Industria y Comercio	El objetivo es contribuir al incremento de la productividad de Paraguay, a través de la implementación coordinada de medidas para las MIPYMES paraguayas, conducentes a facilitar su formalización, capacitación y su acceso al financiamiento.	Nacional	2020 - s/d	En ejecución
24	InnovandoPy - Programas de promoción de la creatividad y nuevas ideas.	Ministerio de Industria y Comercio	Busca identificar ideas tecnológicas innovadoras, inspirar y motivar a jóvenes emprendedores, conectar el sector privado con el público, colaborar con el desarrollo de proyectos con base digital y alto potencial de crecimiento y consolidar el ecosistema de emprendimientos con base tecnológica en Paraguay.	Nacional	2015 - s/d	En ejecución
25	MiPYME Compite	Ministerio de Industria y Comercio	Programa que busca mejorar el marco jurídico, político e institucional para fortalecer el sector privado en Paraguay, aumentar la competitividad de las MIPYMES y mejorar el clima de negocios para la actividad empresarial, el comercio y las inversiones en el país, promoviendo una gestión ambiental responsable.	Nacional	2020/2023	s/d

Nro.	Proyecto/Programa	Institución	Descripción resumida	Alcance geográfico	Fechas de ejecución	Situación
26	Proyecto Salud Familiar Comunitaria.	Tesai reka - MSPBS	La finalidad del proyecto es contribuir al fortalecimiento de las Unidades de Salud Familiar, desarrollando acciones que redunden en beneficio de la salud de comunidades rurales a través del mejoramiento de las capacidades de dichas unidades, el incremento de la población que accede a los servicios de salud, promoviendo el cambio de conocimiento y comportamiento en relación a Salud Sexual y Reproductiva e incorporando el enfoque de Gestión y Reducción del Riesgo en las comunidades.	Concepción, San Pedro, Caaguazú y Canindeyú.	2019 - s/d	En ejecución
27	Proyecto Mejorando la seguridad alimentaria y las oportunidades económicas en el departamento de Concepción en Paraguay.	OCRC - IAF Inter-American Foundation	Brinda asistencia técnica a pequeños agricultores orgánicos y capacitación laboral y de liderazgo para jóvenes y mujeres. Sus actividades ayudan a mejorar la seguridad alimentaria y el potencial de generación de ingresos.	Departamento de Concepción.	2018 - 2021	En ejecución
	Construcción de viviendas sociales	MUVH y FONAVIS	328 Viviendas sociales que fueron entregadas	Paso Barreto y Horqueta		Finalizó en junio de 2020

Tipo	Obra en curso	Longitud	Estado
Pavimentación asfáltica	Tramo Concepción - Puerto Vallemi y Acceso a Concepción (1,5 Km) y Variante (4,75 Km)	6,25 km	Inaugurado 16/10/2020
Pavimentación asfáltica sobre empedrado	Tramo Horqueta - Río Ypané (Tacuati) (Lote 1)	39 km	19/10/2020
	Tramo Ruta 5 - Jhugua Ocampos - Ykua Jhovv - San Blas. 5ta. Tanda. Lote 3	17,56 Km	En ejecución
	Tramo Loreto - Las Palmas - San Blas - Ruta 5. 5ta. Tanda de la Dirección de Vialidad. Lote 6.	15,1 Km	En ejecución
Contrato de rehabilitación y mantenimiento	Vial 3. Ruta PY05 Tramo Concepción - Pozo Colorado Km 372+260 al Km 416+222. Lote3	44 Km	Inicio oficial
Rehabilitación y mantenimiento	Ruta PY05. Tramo: Concepción - Yby Yaú (109 Km). Lote2	109 Km	En proceso (noticia julio 2020)
Obras de alcantarillado sanitario	Construcción de unidades sanitarias para comunidades beneficiadas del proyecto de alcantarillado sanitario para ciudades intermedias de la Región Oriental	-----	en proceso
Pavimentación asfáltica	Asfalto Puentesño-Bella Vista Norte/avance del 15%	-----	Terraplen en proceso
Avance en la pavimentación asfáltica	Arroyito a calle 18-56% de ejecución	En proceso	

2- Proyectos identificados en el marco de elaboración de la evaluación de impactos acumulativos

Nro.	Proyecto/ Programa	Institución	Resumen	Alcance geográfico	Fechas de ejecución	Situación
1	Sistema de alcantarillado sanitario y planta de tratamiento de aguas residuales para la ciudad de Horqueta	Ministerio de Obras Públicas y Comunicaciones	Financiación del Banco Interamericano de desarrollo (BID). Prevé la construcción del sistema de alcantarillado sanitario para el casco urbano de la ciudad de Horqueta; además se contempla la construcción de la planta de tratamiento de aguas residuales, que estará ubicada en el límite norte de la ciudad, en un predio municipal de aproximadamente 10 hectáreas.	Distrito de Horqueta		Proyecto planificado
2	Adecuación ambiental del sistema de alcantarillado sanitario de Concepción - ESSAP S.A.”	Empresa de Servicios Sanitarios del Paraguay	Administrado por la ESSAP S.A., siendo la única empresa concesionaria de los servicios de agua potable y alcantarillado sanitario a nivel país, y opera en la ciudad de Concepción desde finales de la década de 1970.	Distrito de Concepción	En Ejecución	Proyecto planificado
3	Mejoramiento de caminos vecinales en Concepción	Ministerio de Obras Públicas y Comunicaciones	El MOPC impulsa el proyecto de mejoramiento de caminos vecinales del departamento de Concepción planificado ejecutar en el periodo 2020-2025, e incluye el mejoramiento del tramo Loreto - Paso Barreto, equivalente a 37 km.	Distrito de Loreto/Distrito de Paso Barreto	2020-2025	Proyecto planificado

Nro.	Proyecto/ Programa	Institución	Resumen	Alcance geográfico	Fechas de ejecución	Situación
4	Mejoras de la conectividad física del departamento de San Pedro – Tramo Punta Riel – Belén	Fondo de Convergencia del Mercosur (FOCEM)	Forma parte del proyecto de mejoramiento de San Pedro – Belén – Concepción, y tiene como objeto mejorar la transitabilidad del tramo San Pedro del Ycuamandiyú (Empalme Ruta PY11) – Piri Pucu – Potrero Naranjo – Punta Riel – Belén, Belén – Concepción (Antigua traza de la Ruta Nacional N° 5) y el Acceso al Puerto Ybapovó. De acuerdo con los datos del RIMA del proyecto, las obras serán financiadas por el Fondo de Convergencia del Mercosur (FOCEM).	San Pedro/Belén /Concepción	Finalización prevista junio 22	Proyecto planificado
5	Habilitación y Mantenimiento del tramo Pozo Colorado – Concepción	Ministerio de Obras Públicas y Comunicaciones	Impulsado por el MOPC, tiene como objeto rehabilitar 146 km del tramo Pozo Colorado – Concepción, para recuperar sus niveles de servicio de proyecto mediante la tercerización de los servicios, que desarrollará obras civiles, como la rehabilitación y mantenimiento de ruta pavimentada. Se cuenta con el RIMA del proyecto. Las obras serán financiadas por el Banco de Desarrollo de América Latina (CAF), y se han iniciado las obras a finales del año 2019.	146 km del tramo Pozo Colorado – Concepción	2019	Proyecto planificado
6	Mejoramiento del sistema eléctrico de Concepción (Tramo SE)		Los trabajos realizados para la puesta en servicio de la Subestación Móvil de 30 MVA, consistieron en la conexión de la Subestación Móvil a la Línea de Transmisión Vallemí II – Horqueta, con el método a potencial, es decir sin la			En curso

Nro.	Proyecto/ Programa	Institución	Resumen	Alcance geográfico	Fechas de ejecución	Situación
	Horqueta - SE Concepción)		<p>interrupción del suministro de energía eléctrica en la zona de influencia de la Subestación.</p> <p>eleva la confiabilidad y la calidad del suministro de energía eléctrica en la Región Norte, recientemente realizamos la puesta en servicio de la Subestación Móvil 220/23 kV en la Subestación Horqueta, departamento de Concepción, de tal manera a realizar las adecuaciones necesarias para la puesta en servicio de las nuevas y modernas instalaciones de la mencionada subestación, sin la interrupción del suministro eléctrico en la zona³.</p>			
7	Mejoramiento del dragado de la Hidrovía Paraguay - Paraná		<p>De acuerdo con los datos de la caracterización social, MOPC realiza dragados de mantenimiento en el río Paraguay, así como en el río Apa.</p> <p>Adicionalmente, de acuerdo a datos del MOPC y de la Secretaría Técnica de Planificación⁴, se está impulsando un proyecto mayor de dragado de la Hidrovía bajo iniciativa privada, en el marco de la Ley de Alianza Público Privada (Ley N° 5102/13 "De Promoción de la Inversión en</p>			En proceso

³ Estos trabajos para el refuerzo del Sistema de Transmisión en la Región Norte, incluyen además la construcción de la nueva Subestación Villa Real en 220/66/23 kV, la ampliación y modernización de la Subestación Concepción, ambas ubicadas en la localidad de Concepción, además de la construcción de nuevas líneas de transmisión de 220 kV y 66 kV para la interconexión de las mencionadas subestaciones. Disponible en: <https://www.ande.gov.py/interna.php?id=6765#.X5FKztBKg2w>

⁴ <http://www.stp.gov.py/v1/empresas-argentinas-proponen-plan-maestro-para-navegacion-eficiente-en-el-rio-paraguay/>

Nro.	Proyecto/ Programa	Institución	Resumen	Alcance geográfico	Fechas de ejecución	Situación
			Infraestructura Pública y Ampliación y Mejoramiento de los bienes y servicios a cargo del Estado”).			
8	“Mejoramiento del Sistema de Agua Potable para el Desarrollo Regional en la República del Paraguay - ESSAP S.A Ciudad de Concepción	Empresa de Servicios Sanitarios del Paraguay y Ministerio de Obras Públicas y Comunicaciones	El proyecto de “Mejoramiento del sistema de agua potable” fue impulsado de manera conjunta por la ESSAP S.A. y el MOPC Fue ejecutado y concluido a mediados del año 2013, y consistió en la modernización y ampliación de la planta de tratamiento de agua potable en Concepción. Actualmente se encuentra en operación.	Distrito de Concepción	2013	Proyecto en operación
9	Frigorífico Concepción S.A.	Frigorífico Concepción S.A.	Es un emprendimiento industrial que opera desde el año 1977 y en los últimos años ha pasado a convertirse en un importante parque industrial frigorífico, invirtiendo en tecnología de punta y en recursos humanos de amplia experiencia en el rubro ⁵ . Su principal actividad es la producción de carne y subproductos de origen bovino, para luego	Distrito de Concepción	1977	Proyecto en operación

⁵ <https://www.frigorificoconcepcion.com.py/>

Nro.	Proyecto/ Programa	Institución	Resumen	Alcance geográfico	Fechas de ejecución	Situación
			comercializarlos principalmente en los mercados internacionales y, en menor escala, en el mercado interno.			
10	JBS - Belén	JBS Frigorífico Belén	Es un proyecto frigorífico que fue mencionado en las entrevistas realizadas con actores locales, en especial en la zona de la ciudad de Belén donde se desarrolla el emprendimiento. Se destaca que es una de las principales industrias de la zona ⁶ , luego del frigorífico Concepción ⁷	Distrito de Belén	2017	Proyecto en operación

⁶ <https://www.lanacion.com.py/2017/01/03/jbs-paraguay-frigorifico-belen-recio-la-habilitacion-rusia/>

⁷ http://seam.gov.py/sites/default/files/users/control/jbs_b.tablada_rocio.pdf

3- Proyectos mencionados por entrevistados (Actores institucionales y comunitarios)

Los programas y proyectos mencionados por la población consultada son presentados en la siguiente matriz por distrito y técnica aplicada para el relevamiento.

Nro.	Lugar	Programas/ Proyectos	Técnica de relevamiento
1	Loreto	Proyectos para pequeños productores con el MAG (facilitando insumos, fertilizantes, semillas, animales de granja y materiales para corral, herramientas, con la comisión de mujeres, trabajos manuales).	Entrevista institucional
2	Loreto	Programa Tekopora	
3	Loreto	Pensión de Adultos Mayores	Entrevista institucional
4	Loreto	Acompañamiento de la DEAG a grupos de mujeres	Entrevista institucional
5	Loreto	Los proyectos que existen son con recursos propios (cada año apoyo a comités de mujeres con aportes anuales, medios de vida, gallinería, lechería y a nivel urbano todo lo que es infraestructura).	Entrevista institucional
6	Loreto	Proyectos de construcción de USF en algunas comunidades	Entrevista institucional
7	Loreto	Proyecto de mejoramiento de calles y caminos vecinales(para la parte rural, zona Loreto – San Blas – San Josemi)	Entrevista institucional
8	Horqueta	Proyecto de apoyo a productores con FECOPROP.	
9	Horqueta	Plan de Desarrollo Integral	
10	Horqueta	Proyectos no reembolsables. MAG/PRODER: con proyectos de entrega de vaquillas/ tejidos, simbra, chapas y accesorios para cría de gallina/ chanchería.	Entrevista institucional
11	Horqueta	Represa sobre el Río Ypané. (Hidroeléctrica).	Entrevista institucional
12	Horqueta	Vial: Ruta Horqueta- Tacuatî, San Blás. La conexión con ruta X ya está por ser ejecutado. Recapado ruta Yvy Ya'u Concepción.	Entrevista institucional
13	Horqueta	Proyectos de viviendas	
14	Horqueta	Proyecto de planta de tratamiento de aguas residuales (por ejecutarse)	Entrevista institucional
15	Horqueta	Proyecto de alcantarillado sanitario con planta de tratamiento	Entrevista institucional
16	Horqueta	Proyecto Proders/ MAG, actualmente está entregando materiales a los comités para producción de gallinero.	Entrevista Comunitaria

Distrito de Paso Barreto

N°	Localidad	Programas/Proyectos	Técnica de relevamiento
1	Paso Barreto	A licitarse el proyecto de pavimentación asfáltica de la Ruta Loreto – Barreto.	Entrevista
2	Paso Barreto	Construcción de 198 viviendas con el Ministerio de Urbanismo, Vivienda y Hábitat	Entrevista
3	Paso Barreto	Construcción de Unidad de Salud Familiar Ampliada	Entrevista
4	Paso Barreto	A licitarse la construcción de nuevo puente sobre el río Aquidabán	Entrevista
5	Paso Barreto	Construcción y mejora de escuelas y colegios a través de FONACIDE	Entrevista
6	Paso Barreto	Asfaltado de las calles de la ciudad, bajo convenio entre la Municipalidad y el Ministerio de Obras Públicas y Comunicaciones	Entrevista
7	Paso Barreto	Trabajo de reparación para camino de todo tiempo de la ruta Cruce X (Paso Barreto – San Alfredo)	Entrevista
8	Isla Hermosa	Construcción de viviendas con el Ministerio de Urbanismo, Vivienda y Hábitat	Entrevista
9	Isla Hermosa	Colocación de transformadores de alto voltaje con la ANDE	Entrevista
10	Estribo de Plata	Pavimentación Ruta calle 15 – Jorge Sebastián Miranda (Jhugua Ñandu) – Ministerio de Obras Públicas y Comunicaciones	Entrevista
11	Jorge Sebastián Miranda	Construcción de viviendas con Ministerio de Urbanismo, Vivienda y Hábitat	Entrevista
12	Jorge Sebastián Miranda	Construcción de dos aulas para primera infancia en la escuela Dominga Ocariz de Samaniego	Entrevista
13	Jorge Sebastián Miranda	Proyecto entrega de semilla para huerta familiar desde la Municipalidad de Paso Barreto	Entrevista

Distrito de Sargento José Félix López

N°	Localidad	Programas/Proyectos	Técnica de relevamiento
1	Puentesíño	Construcción de 77 viviendas con el Ministerio de Urbanismo, Vivienda y Hábitat (MUVH)	Entrevista
2	Puentesíño	Construcción de polideportivo municipal	Entrevista
3	Sargento José Félix López	Programa Alimentario Nutricional PANI	Entrevista
4	Sargento José Félix López	Mejoramiento de calles, para caminos de todo tiempo	Entrevista
5	Sargento José Félix López	Programas con el Ministerio de Agricultura: PRODEERS, PRONAFROPE, PIMA	Entrevista

N°	Localidad	Programas/Proyectos	Técnica de relevamiento
6	Sargento José Félix López	Asistencia municipal en preparación de suelo con los pequeños productores	Entrevista
7	Sargento José Félix López	Pavimentación asfáltica desde Calle 15 a Puentesíño – Ministerio de Obras Públicas y Comunicaciones	Entrevista

Distrito de Loreto

N°	Localidad	Programas/Proyectos	Técnica de relevamiento
1	Virgen del camino	SENASA: Proyecto de mejora de baño.	Entrevista
	Virgen del camino	Proyecto de conformación de Junta de saneamiento y un pozo artesiano.	Entrevista
2	Virgen del camino	Construcción de Viviendas con el MUVH	Entrevista
3	Virgen del camino	Asistencia técnica a productores de la comunidad, desde la Dirección de Extensión Agraria del Ministerio de Agricultura	Entrevista
4	Santísima Trinidad	Programa Tekoporá del Ministerio de Desarrollo Social	Entrevista
5	Santísima Trinidad	Programa de Tercera Edad del Ministerio de Hacienda	Entrevista
6	Santísima Trinidad	SENASA: Proyecto de mejora de baño	Entrevista
7	Jhugua Po'i	Presentación de proyecto de construcción de viviendas sociales – MUVH.	Entrevista
8	Jhugua Po'i	Construcción de Unidad de Salud Familiar Ampliada	Entrevista
9	Jhugua Po'i	Asistencia técnica a productores de la comunidad desde la Dirección de Extensión Agraria del Ministerio de Agricultura y PRODERS	Entrevista
10	Jhugua Guazú	Asistencia técnica a productores de la comunidad desde la Dirección de Extensión Agraria del Ministerio de Agricultura	Entrevista
11	Jhugua Guazú	Construcción de aulas con fondos de la Gobernación	Entrevista
12	Jhugua Guazú	Construcción de viviendas. MUVH	Entrevista
13	Jhugua Guazú	Construcción de Unidad de Salud Familiar Ampliada	Entrevista
14	Islería	Programa Tekoporá del Ministerio de Desarrollo Social	Entrevista
15	Islería	Programa de Tercera Edad del Ministerio de Hacienda	Entrevista
16	Laguna Cristo Rey	Programa Tekoporá del Ministerio de Desarrollo Social	Entrevista

N°	Localidad	Programas/Proyectos	Técnica de relevamiento
17	Laguna Cristo Rey	Programa de Tercera Edad del Ministerio de Hacienda	Entrevista
18	Anderí	Reparación de puente de madera autogestionada por la comunidad	Entrevista

Distrito de Horqueta

N°	Localidad	Programas/Proyectos	Técnica de relevamiento
1	Paso Mbutu	Construcción de viviendas MUVH	Entrevista
2	Calle 15	Mejora de la escuela y posible construcción de aulas	Entrevista
3	Paso Mbutu y Calle 15	Pavimentación Ruta calle 15 - Jhugua Ñandu - Ministerio de Obras Públicas y Comunicaciones	Entrevista
4	Domínguez Nlgó	Proyecto de construcción de viviendas. MUVH	Entrevista

Distrito de Bella Vista Norte

N°	Localidad	Programas/Proyectos	Técnica de relevamiento
1	Ayala Cue	Ejecución de proyecto para construcción de baños diferenciados y aulas - MEC	Entrevista

ANNEX II
eDNA FINAL REPORT (NATUREMETRICS)



VERTEBRATE METABARCODING RESULTS

Order number:	101890
Company:	PARACEL S.A.
Contact:	Cyro Croce
Project:	Planta de Celulosa
Sample type:	NatureMetrics eDNA disk filter
Date of report:	4 June 2021
Report version:	3
Number of samples:	115

Thank you for sending your samples for analysis by NatureMetrics. Your samples have been **metabarcoded** following our **eDNA survey - Vertebrates** pipeline. **A taxon-by-sample table of your samples is attached to this report (Paracel_101890.client_tables.xlsx: Table 7).** Care should be taken in interpreting the numbers in terms of relative species abundance, but a high sequence proportion can be interpreted as lending greater confidence to a detection.

Here we present an overview of the key results, followed by a more detailed report that starts with the taxonomic composition of the samples followed by a more detailed look at the steps taken to extract, amplify, sequence, and analyse your DNA. A glossary for terms in **bold** is provided at the end of the report to define key terms used within the report.

Please note results are summarised by Property in the body of this report. Full results by sample can be found in the attached tables (**Paracel_101890.client_tables.xlsx: Tables 5, 6, 7**). A shapefile summarising the key results is also provided (**Paracel_101890.richness_summary.***). A description of the fields included in the shapefile can be found in the attached table (**Paracel_101890.client_tables.xlsx: Tables 8**).

OVERVIEW OF YOUR RESULTS

- A total of 357 **taxa** were detected
- Average taxonomic **richness** was 39.9 and ranged from 4 to 90
- Most abundant **sequences**: *Pimelodella* sp.
- Most commonly detected **species**: *Hoplias* sp.
- 8 species categorised on the **IUCN Red List** were detected: 5 **Near Threatened** and 3 **Vulnerable**.



FULL REPORT

Sample composition

A total of 357 taxa were detected (**101890.client_tables.xlsx**). 39.5% (141 taxa) were at least 99% similar to a species in the global **reference databases**, and **species** names are suggested for these taxa. The remaining taxa were identified to the lowest possible taxonomic level: 40% to **genus** (143 taxa), 9.8% to **family** (35 taxa), and the remainder to **order** (38 taxa). The taxa belong to 5 **classes**, 38 orders, 90 families, and 188 genera. The taxon count per class was: 195 fish, 30 amphibians, 78 birds, 50 mammals, and 4 reptiles. Note that taxa are approximately equivalent to species but some over- and under-estimation of diversity in some lineages is possible.

Species of note included eight species categorised on the IUCN Red List: turquoise-fronted Amazon (NT, *Amazona aestiva*), greater rhea (NT, *Rhea americana*), Neotropical otter (NT, *Lontra longicaudis*), Chacoan naked-tailed armadillo (NT, *Cabassous chacoensis*), and black-and-gold howler monkey (NT, *Alouatta caraya*), White-lipped peccary (VU, *Tayassu pecari*), South American tapir (VU, *Tapirus terrestris*), and Giant anteater (VU, *Myrmecophaga tridactyla*) (**Table 1**). These were generally limited to a small number of samples, except the Neotropical otter, South American tapir, and Giant Anteater which were found in 11, 10, and 8 of 14 Properties respectively. The number of threatened species detections per sample varied from 0 (51 samples) to 5 (1 sample; **Figure 1**).

The average species richness was 39.9 and ranged from 4 (HE-HU09) to 90 (CR-AQU07). The relative proportion of the sequences found in each of the Properties is summarised by order in **Figure 2** and taxon diversity per Property is summarised in **Table 3** and **Table 4**. For a summary of sequencing proportion per species and genus per Property see **Figure 3** (attached separately). Results per sample can be found in **101890.client_tables.xlsx** (**Tables 5, 6, 7**).

A three-barbeled catfish species (*Pimelodella* sp.), which accounted for 7.34% of the total sequence reads, was among the most abundant in terms of sequences. Among the most commonly detected species were a trahiras fish species (*Hoplias* sp.), a characid fish species (Characidae sp.), and a pike cichlid (*Crenicichla lepidota*), which were detected in 101, 98, and 92 of the samples, respectively.

High-quality vertebrate sequence data were obtained for all eDNA samples. All but one laboratory controls behaved as expected. Results for samples ZA-NEG34, ZA-NEG-35, and ZA-NEG36 should be treated as tentative, see Methods for details.

Table 1. Threatened species detected, their IUCN Red List category, and the number of detections.

Class	Species	Red List	Samples	Properties
Aves	Turquoise-fronted Amazon (<i>Amazona aestiva</i>)	NT	2	2
Aves	Greater Rhea (<i>Rhea americana</i>)	NT	1	1
Mammalia	Neotropical Otter (<i>Lontra longicaudis</i>)	NT	31	11
Mammalia	Chacoan Naked-tailed Armadillo (<i>Cabassous chacoensis</i>)	NT	1	1
Mammalia	Black-and-gold Howler Monkey (<i>Alouatta caraya</i>)	NT	8	5
Mammalia	White-lipped Peccary (<i>Tayassu pecari</i>)	VU	6	4
Mammalia	South American Tapir (<i>Tapirus terrestris</i>)	VU	37	10
Mammalia	Giant Anteater (<i>Myrmecophaga tridactyla</i>)	VU	19	8

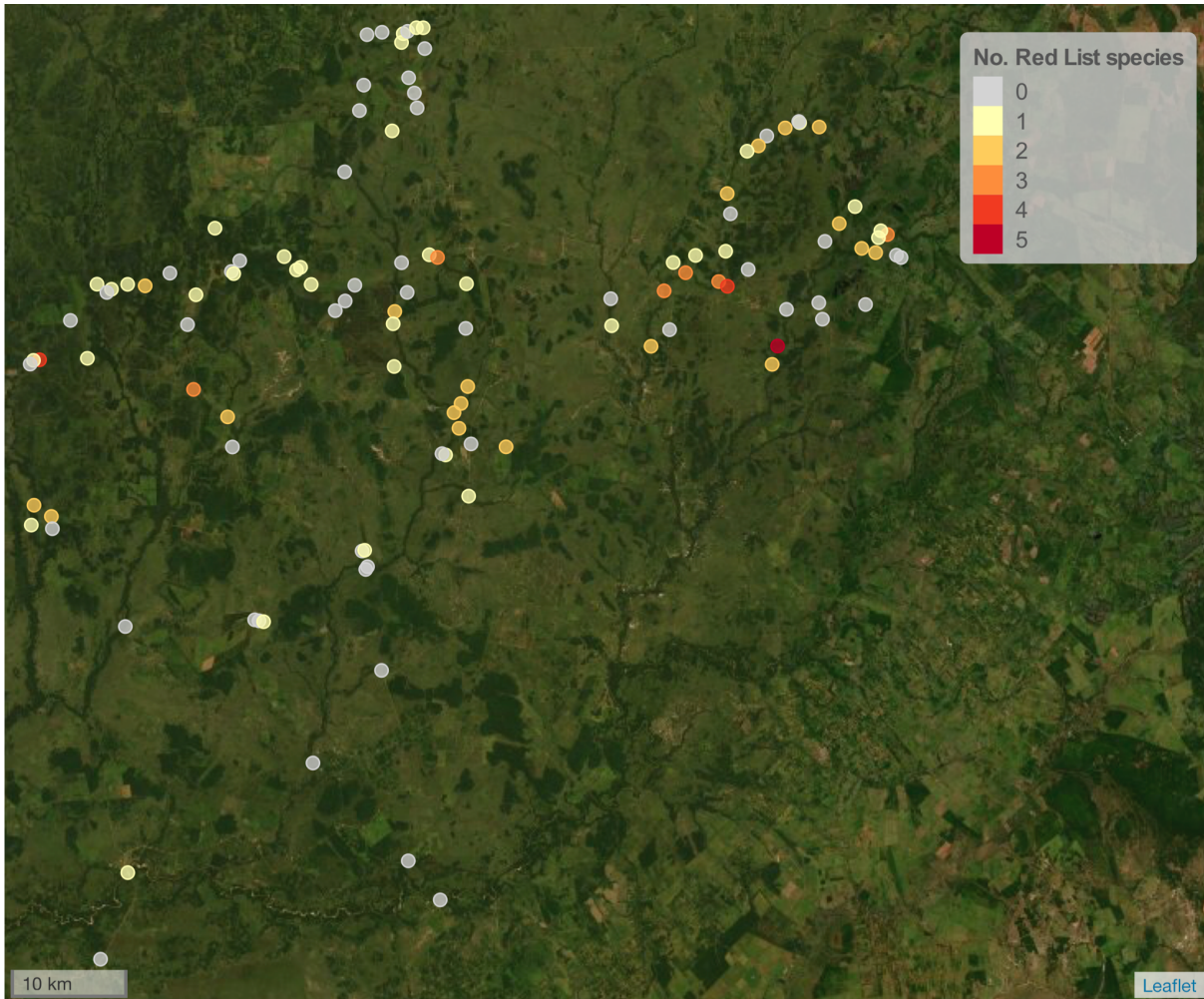


Figure 1. Map showing the locations at which IUCN Red List species were found. Sample locations are coloured by the number of threatened species detected. The number of detections varies between 0 (51 samples) and 5 (1 sample).

Table 2. Number of samples per Property and the 2-letter codes used in this report.

Code	Property	# Samples	Code	Property	# Samples
CR	Cristo Rey	2	SL	San Liberato	11
GA	Gavilan	5	SO	Soledad	8
HE	Hermosa	15	ST	Santa Teresa	26
LB	La Blanca	2	TR	Trementina	9
MC	Machuca Cue	3	VS	Villa Sana	5
MJ	Mandiyu	5	ZA	Zapallo	9
RZ	Rancho Z	4	ZM	Zanja Moroti	11

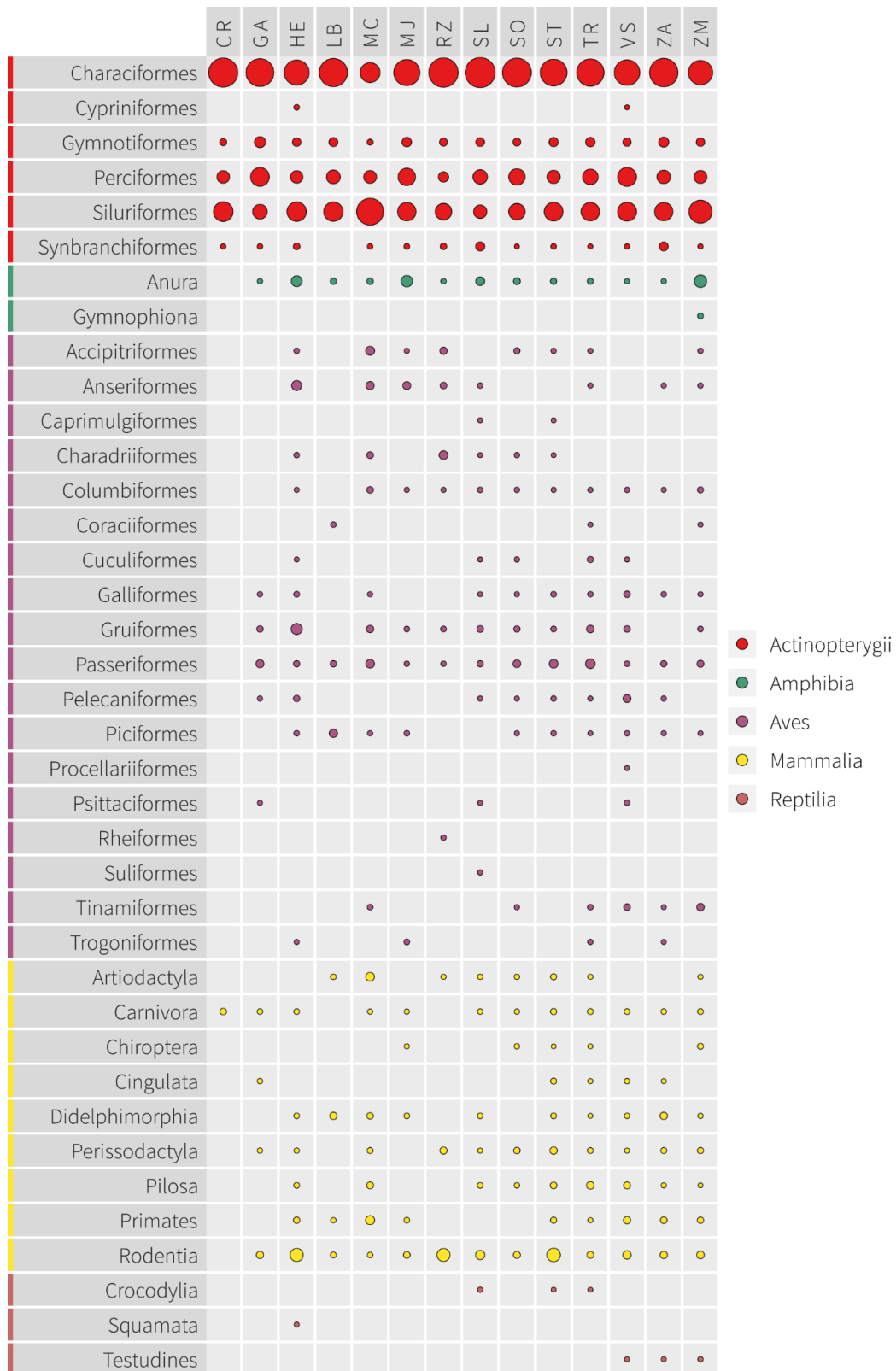


Figure 2. The proportion of the sequencing output allocated to the different orders (rows) within each Property (columns). Each bubble represents the proportion of DNA for each order for that Property. The size of the bubble is relative to the number of sequences from all taxa for that Property.



Table 3. Taxon richness among the Properties.

Property	Class	Order	Family	Genus	Taxa (IDed to species)
CR	2	6	23	65	113 (45)
GA	4	15	32	51	87 (33)
HE	5	25	52	82	130 (57)
LB	4	12	32	66	111 (42)
MC	4	22	38	56	93 (35)
MJ	4	18	39	71	120 (46)
RZ	4	16	29	37	58 (21)
SL	5	24	46	86	137 (62)
SO	4	22	37	54	80 (33)
ST	5	25	62	118	210 (80)
TR	5	28	54	91	159 (66)
VS	5	25	44	66	107 (38)
ZA	5	22	52	89	149 (60)
ZM	5	25	44	75	117 (53)

Table 4 (attached separately). The frequency of occurrence of all detected families per Property. Numbers correspond to the number of taxa belonging to those families in those Properties.

Table 5 (attached separately). Taxon richness among the samples.

Table 6 (attached separately). The frequency of occurrence of all detected families per sample. Numbers correspond to the number of taxa belonging to those families in those samples.

Table 7 (attached separately). A taxon-by-sample table of the proportion of the sequencing output allocated to each taxon in each sample.

Table 8 (attached separately). A description of the fields included in the attached shapefile (**Parcel_101890.richness_summary.***).

Figure 3 (attached separately). The proportion of the sequencing output allocated to the different species and genera (rows) within each Property (columns). Each bubble represents the proportion of DNA for each species/genus for that Property. The size of the bubble is relative to the number of sequences from all taxa for that Property.

METHODS

Laboratory

DNA from each filter was extracted using a commercial DNA extraction kit with a protocol modified to increase DNA yields. DNA was purified to remove PCR **inhibitors** using a commercial purification kit.

Comment: The average yield was 22.25 ng/μl and ranged from 0.402 ng/μl (ZA-NEG14) to 132 ng/μl (MJ-HU16). Sample RZ-TRM64 had a DNA yield below the limit of quantification but successfully passed all subsequent steps. Analysis of the sequence data indicated a possible contamination event during DNA extraction of one batch of samples. Three samples were potentially affected and results from these should be treated as tentative (ZA-NEG34, ZA-NEG-35, ZA-NEG36). All three samples show very similar composition, possibly resulting from contamination, however they are taken from the same Property and may therefore indicate true similarity between samples.

Purified DNAs were amplified with 8-11 replicate **PCRs** for a hypervariable region of the 12S rRNA gene to target vertebrates as part of the eDNA survey - Vertebrates pipeline.

All PCRs were performed in the presence of both a **negative control** and a **positive control** sample (a mock community with a known composition). Amplification success was determined by **gel electrophoresis**.

Comment: PCR reactions were consistently successful for all samples. Electrophoresis bands were strong and of the expected size and no PCRs required repeating.

PCR replicates were pooled and purified, and sequencing adapters were added. Success was determined by gel electrophoresis.

Comment: All samples were successfully indexed, electrophoresis bands were strong and of the expected size. No repeat reactions were necessary.

Amplicons were purified and checked by gel electrophoresis, these were then quantified using a Qubit high sensitivity kit according to the manufacturer's protocol.

Comment: All amplicons were successfully purified and were of high yield (**Table 9**).

All purified index PCRs were pooled into a final library with equal concentrations. The final library was sequenced using an Illumina MiSeq V3 kit at 10 pM with a 20% PhiX spike in.

Table 9 (attached separately). The volume of water filtered and the resultant concentration of purified DNA and index PCRs.

Data Analysis

Sequence data were processed using a custom **bioinformatics** pipeline for quality filtering, OTU clustering, and taxonomic assignment.

Comment: Both negative and positive controls were as expected. Very few sequences were discarded prior to dereplication, which is indicative of high-quality data with minimal PCR and sequencing errors. A total of 6.1 million high-quality sequences were included in the final dataset.

Taxonomic information was added to each **OTU** by means of sequence similarity searches against the NCBI *nt* **reference database** (GenBank) and PROTAX, a probabilistic method that makes assignments at each taxonomic level (species, genus, family, order). Species-level assignments were automatically retained if supported by unambiguous matches to reference sequences at $\geq 99\%$. In cases where there were equally good matches to multiple species, public records from GBIF were used to assess which were most likely to be present. Multiple potential identifications were reported in cases that could not be resolved in this way. Note that multiple OTUs can be identified as belonging to the same species, which is most likely attributed to PCR or sequencing artefacts but potentially intraspecific genomic variation or cryptic diversity.

The OTU table was then filtered to remove low abundance OTUs from each sample ($<0.025\%$ or <10 reads, whichever is the greater threshold for the sample). Common **contaminant sequences** such as human, domestic animals and livestock were then removed. Results are presented for OTUs identified to order or below. Note that unidentified or misidentified taxa can result from incomplete or incorrect reference databases, and taxa may be missed due to low quality DNA, environmental contaminants, or the dominance of other species in the sample.

Limitations

Methodologies have been chosen based on the state of the art, but these choices inherently introduce specific limitations and biases. The chosen **primers** capture the target group well in our experience, however some lineages will be recovered more efficiently than others as no primers work equally well for all target species, especially where the target group is broad. Some lineages are also prone to over-splitting of species, with multiple taxa recovered where only one is expected. Conversely, other lineages are prone to lumping, where multiple species are represented by a single taxon because they have identical sequences in the amplified region.

Comment: In this project, 8 taxa were recovered in the family Tayassuidae but only 3 extant species are known. 3 of these taxa matched most closely to an extinct species of Tayassuidae, the Flat-headed peccary (*Platygonus compressus*). Identifications for these taxa have been revised to family level. It is possible that the 8 taxa represent significant intraspecific genetic variation within *Pecari tajacu* and *Tayassu pecari* that has not previously been captured in the reference databases. Alternatively several of these taxa may represent nuclear-mitochondrial pseudogenes (NUMTs). These represent cases where mitochondrial genes have been inserted into the nuclear genome. These sequences diverge from the true mitochondrial sequence over time, accumulating differences. Such cases are difficult to identify but are likely to affect some lineages more than others.

Assigning taxonomic identities to the sequences is only possible through their comparison to reference databases, which are incomplete and may include sequences which have been misidentified. It is not possible to identify a species that is not represented in the reference database for the targeted gene region. Equally, many species are represented by a single sequence, meaning that the full genetic diversity of the species is not known. For widespread species with distinct populations this can limit our ability to make a species-level identification.

Where there are conflicting matches, the likelihood of presence in the country is used to discriminate between matches if possible. Where records are poor, this step may incorrectly prioritise species for which there are observations. Where matches are sufficient for species-or genus-level identification but the taxon is not known in the sampled country, the identification is reported as tentative. Where



threatened species are detected, manual steps are taken to evaluate the likelihood of presence in the sampling area and only confident detections are reported.

Comment: Chacoan naked-tailed armadillo (*Cabassous chacoensis*, Near Threatened) was detected in one sample in this project. Although this species is not thought to occur in the sampling area it is present in western-central Paraguay and the identification is secure based on currently available reference sequences. All three species in the genus that occur in Paraguay are represented by one or more references and the match to *Cabassous chacoensis* was at 100% similarity (*Cabassous unicinctus*: 98.1%; *Cabassous tatouay*: 98.1%).

Please note that the abundance of taxa cannot be directly inferred from the proportion of total sequence reads. While the proportion of sequence reads is a consequence of abundance, it is also impacted by biomass, activity, surface area, condition, distance from the physical sample, primer bias, and species-specific variation in the genome.

END OF REPORT

Report issued by: **Laura Balcells**

Contact: **team@naturemetrics.co.uk**



GLOSSARY

bioinformatics

Refers to a data processing pipeline that takes the raw sequence data from **high-throughput sequencing** (often 20 million sequences or more) and transforms it into usable ecological data. Key steps for **metabarcoding** pipelines include quality filtering, trimming, merging paired ends, removal of sequencing errors such as chimeras, clustering of similar sequences into molecular operational taxonomic units (**OTUs**; each of which approximately represents a species), and matching one sequence from each cluster against a reference database. The output is a species-by-sample table showing how many sequences from each sample were identified as each species.

contaminant sequences

The sensitivity of high-throughput sequencing of eDNA means that contamination is always a concern that needs to be minimised. The sources of contamination are threefold:

Natural Examples of natural contaminants include: frequent visitors to site, faecal discharge from predators, livestock, wastewater, and fishing bait. This type of contamination is typically unavoidable and very difficult to quantify. Sequences of this type are typically flagged and conservatively removed from the sequencing output. Typical contaminant species include cow, pig, dog, cat, sheep, etc.

Sampling Human contamination of sampling equipment can reduce the efficiency of the sequencing. This type of contamination can be minimised by stringent contamination protocols, such as PPE.

Laboratory Residual DNA can contaminate other samples processed at the same time in other labs. At NatureMetrics this is mitigated by a designated eDNA laboratory, strict decontamination procedures, negative controls, and good laboratory practices.

eDNA

Short for 'environmental DNA'. Refers to DNA deposited in the environment through excretion, shedding, mucous secretions, saliva etc. This can be collected in environmental samples (e.g. water, sediment) and used to identify the organisms that it originated from. eDNA in water is broken down by environmental processes over a period of days to weeks. It can travel some distance from the point at which it was released from the organism, particularly in running water. eDNA is sampled in low concentrations and can be degraded (i.e. broken into short fragments), which limits the analysis options.

gel electrophoresis

The process in which DNA is separated according to size and electrical charge via an electric current, while in a gel. The process



is used to confirm the successful amplification of a specific size fragment of DNA.

high-throughput sequencing

Technology developed in the 2000s that produces millions of sequences in parallel. Enables thousands of different organisms from a mixture of species to be sequenced at once, so community DNA can be sequenced. Various different technologies exist to do this, but the most commonly used platform is Illumina's MiSeq. Also known as Next-Generation Sequencing (NGS) or parallel sequencing.

inhibitors/inhibition

Naturally-occurring chemicals/compounds that cause DNA amplification to fail, potentially resulting in false negative results. Common inhibitors include tannins, humic acids and other organic compounds. Inhibitors can be overcome by either diluting the DNA (and the inhibitors) or by additional cleaning of the DNA, but dilution carries the risk of reducing the DNA concentration below the limits of detection. At NatureMetrics, inhibition is removed using a commercial purification kit.

IUCN Red List

The IUCN (International Union for the Conservation of Nature) is a global union of government and civil organisations that disseminates information to assist conservation. The IUCN Red List of Threatened Species is an inventory of the conservation status of over 100,000 species worldwide. The Red List evaluates data such as population trends, geographic range and the number of mature individuals in order to categorise species based on their extinction risk:

Extinct (EX) - No individual of this species remains alive.

Extinct in the Wild (EW) - Surviving individuals are only found in captivity.

Critically Endangered (CE) - species faces an extremely high risk of extinction in the wild. e.g. Population size estimated at fewer than 50 mature individuals.

Endangered (E) - species faces a very high risk of extinction in the wild. e.g. Population size estimated at fewer than 250 mature individuals.

Vulnerable (V) - species faces a high risk of extinction in the wild. e.g. Population size estimated at fewer than 10,000 mature individuals and declining.

Near Threatened (NT) - species is below the threshold for any of the threatened categories (CE, E, V) but is close to this threshold or is expected to pass it in the near future.

Least Concern (LC) - species is not currently close to qualifying for any of the other categories. This includes widespread and abundant species.

Data Deficient (DD) - There is currently insufficient data available to make an assessment of extinction risk. This is not a threat category - when more data becomes

available the species may be recategorised as threatened.

metabarcoding

Refers to identification of species assemblages from community DNA using barcode genes. PCR is carried out with non-specific primers, followed by high-throughput sequencing and bioinformatics processing. Can identify hundreds of species in each sample, and 100+ different samples can be processed in parallel to reduce sequencing cost.

negative control

Used to determine if PCR reactions are contaminated.

OTU

Short for Operational Taxonomic Unit, which is used to classify a group of closely related individuals. For prokaryotes, these groupings are defined using the DNA sequences and their similarities (97% similar to one another). OTUs are thought of as distinct species and unique labels are used when taxonomic identification cannot be assigned.

PCR

Short for Polymerase chain reaction. A process by which millions of copies of a particular DNA segment are produced through a series of heating and cooling steps. Known as an 'amplification' process. One of the most common processes in molecular biology and a precursor to most sequencing-based analyses.

positive control

Used to determine whether the assay is working correctly.

primers

Short sections of synthesised DNA that bind to either end of the DNA segment to be amplified by PCR. Can be designed to be totally specific to a particular species (so that only that species' DNA will be amplified from a community DNA sample), or to be very general so that a wide range of species' DNA will be amplified. Good design of primers is one of the critical factors in DNA-based monitoring.

reference databases

Over time, the DNA sequences of many species have been compiled into publicly accessible databases by scientists from around the world. These databases serve as a reference against which unknown sequences can be queried to obtain a species identification. The most commonly accessed database is NCBI (National Center for Biotechnology Information), which is maintained by the US National Institute of Health. Anyone can search for DNA sequences at <https://www.ncbi.nlm.nih.gov>.

richness

Refers to the total number of species within a sample.

sequences

A DNA sequence is made up of four nucleotide bases represented by the letters A, T, C & G. The precise order of these letters is used to compare genetic similarity among individuals or species and to identify species using reference databases. In high-throughput sequencing analyses (e.g. metabarcoding), many identical copies of the same sequence are obtained for each species in the sample.

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The number of copies obtained per species is known as the number of sequence reads, and this is often - although not always - related to the relative abundance of the species.

taxon (s.) / **taxa** (pl.)

Strictly, a taxonomic group. Here we use the term to describe groups of DNA sequences that are equivalent to species. We do not use the term species because we are unable to assign complete identifications to all of the groups at this time due to gaps in the available reference databases.

taxonomy

species (s./pl.) - A group of individuals capable of interbreeding. This is the most important taxonomic unit defined by scientists and the population trends of individual species are a key indicator in judging the effect of conservation programs. Related species are grouped together into progressively larger taxonomic units, from genus to kingdom. *Homo sapiens* (human) is an example of a species.

genus (s.) / **genera** (pl.) - A group of closely related species. Each genus can include one or more species. *Homo* is an example of a genus.

family (s.) / **families** (pl.) - A group of closely related genera. *Homo sapiens* is in the family Hominidae (great apes).

order (s.) / **orders** (pl.) - A group of closely related families. *Homo sapiens* is in the order Primates.

class (s.) / **classes** (pl.) - A group of closely related orders. *Homo sapiens* is in the class Mammalia.



Family frequency among the Properties.

Class	Order	Family	CR	GA	HE	LB	MC	MJ	RZ	SL	SO	ST	TR	VS	ZA	ZM	# samples
Actinopterygii	Characiformes	Acestrorhynchidae	1	1	1	1	0	1	0	1	0	1	1	1	1	0	10
Actinopterygii	Characiformes	Anostomidae	6	1	2	8	1	3	1	3	1	7	2	4	4	4	14
Actinopterygii	Characiformes	Characidae	20	20	16	18	17	21	11	23	12	26	23	18	21	15	14
Actinopterygii	Characiformes	Crenuchidae	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14
Actinopterygii	Characiformes	Curimatidae	4	2	2	3	2	2	1	2	1	5	2	2	3	2	14
Actinopterygii	Characiformes	Erythrinidae	4	3	2	4	2	5	2	3	2	4	5	4	4	3	14
Actinopterygii	Characiformes	Iguanodectidae	0	0	0	0	0	0	0	0	0	1	0	0	1	0	2
Actinopterygii	Characiformes	Prochilodontidae	1	0	1	1	0	1	1	1	1	1	1	1	1	1	12
Actinopterygii	Characiformes	Serrasalminidae	6	1	1	2	1	3	1	5	1	5	5	2	2	1	14
Actinopterygii	Cypriniformes	Cyprinidae	0	0	1	0	0	0	0	0	0	0	0	1	0	0	2
Actinopterygii	Gymnotiformes	Apteronotidae	2	0	0	1	0	0	0	0	0	2	1	0	2	0	5
Actinopterygii	Gymnotiformes	Gymnotidae	1	3	3	2	2	2	2	2	3	3	3	1	3	3	14
Actinopterygii	Gymnotiformes	Hypopomidae	0	2	1	1	0	3	2	3	0	3	4	1	2	0	10
Actinopterygii	Gymnotiformes	Rhamphichthyidae	0	0	0	0	0	0	0	0	0	1	0	0	1	0	2
Actinopterygii	Gymnotiformes	Sternopygidae	2	1	1	4	0	2	1	2	1	6	4	2	6	1	13
Actinopterygii	Perciformes	Centrarchidae	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Actinopterygii	Perciformes	Cichlidae	3	3	3	3	3	4	3	4	3	6	5	2	3	2	14
Actinopterygii	Perciformes	Sciaenidae	0	0	0	1	0	0	0	1	0	1	0	0	0	0	3
Actinopterygii	Siluriformes	Auchenipteridae	1	0	0	1	2	1	1	0	0	2	1	0	2	0	8
Actinopterygii	Siluriformes	Callichthyidae	3	4	6	3	5	5	0	4	4	4	7	5	2	6	13
Actinopterygii	Siluriformes	Cetopsidae	1	0	0	0	0	0	0	0	0	1	0	0	1	0	3
Actinopterygii	Siluriformes	Doradidae	7	0	0	4	0	0	0	0	0	1	2	1	1	0	6
Actinopterygii	Siluriformes	Heptapteridae	6	3	7	5	7	5	3	4	6	9	6	6	7	6	14
Actinopterygii	Siluriformes	Loricariidae	17	8	12	17	7	12	4	13	6	20	13	9	17	6	14
Actinopterygii	Siluriformes	Pimelodidae	7	0	0	4	0	1	0	3	0	6	3	0	6	0	7
Actinopterygii	Siluriformes	Pseudopimelodidae	2	1	2	3	1	1	1	1	1	3	2	1	2	0	13
Actinopterygii	Siluriformes	Trichomycteridae	1	1	1	1	1	1	0	1	0	3	1	1	3	1	12
Actinopterygii	Synbranchiformes	Synbranchidae	1	2	2	0	2	3	1	3	1	2	2	2	2	2	13
Amphibia	Anura	Bufonidae	0	0	0	0	0	1	0	0	0	2	0	0	0	3	3
Amphibia	Anura	Dicroglossidae	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Amphibia	Anura	Hylidae	0	0	6	2	1	2	0	6	4	2	0	0	1	6	9
Amphibia	Anura	Leptodactylidae	0	1	5	0	3	2	1	3	2	3	2	2	0	5	11
Amphibia	Anura	Odontophrynidae	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Amphibia	Anura	Phyllomedusidae	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Amphibia	Anura	Ranidae	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Amphibia	Gymnophiona	Siphonopidae	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Aves	Accipitriformes	Accipitridae	0	0	1	0	1	1	1	0	0	1	1	0	0	1	7
Aves	Accipitriformes	Cathartidae	0	0	0	0	1	1	1	0	1	1	0	0	0	0	5

Aves	Anseriformes	Anatidae	0	0	3	0	1	2	1	2	0	0	1	0	1	2	8
Aves	Caprimulgiformes	Caprimulgidae	0	0	0	0	0	0	0	1	0	1	0	0	0	0	2
Aves	Charadriiformes	Charadriidae	0	0	0	0	0	0	1	0	1	1	0	0	0	0	3
Aves	Charadriiformes	Jacanidae	0	0	1	0	0	0	1	1	0	1	0	0	0	0	4
Aves	Charadriiformes	Scolopacidae	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Aves	Columbiformes	Columbidae	0	0	2	0	1	2	1	1	1	2	1	1	1	1	11
Aves	Coraciiformes	Alcedinidae	0	0	0	1	0	0	0	0	0	0	1	0	0	1	3
Aves	Cuculiformes	Cuculidae	0	0	1	0	0	0	0	1	1	0	1	1	0	0	5
Aves	Galliformes	Cracidae	0	1	2	0	2	0	0	1	1	3	2	2	1	1	10
Aves	Gruiformes	Rallidae	0	3	2	0	2	1	1	3	2	5	3	1	0	1	11
Aves	Passeriformes	Campephagidae	0	0	1	1	1	0	0	0	0	1	1	0	0	1	6
Aves	Passeriformes	Cardinalidae	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Aves	Passeriformes	Corvidae	0	0	2	0	0	0	0	0	0	1	1	1	1	2	6
Aves	Passeriformes	Furnariidae	0	0	1	0	0	0	0	0	0	0	0	0	1	0	2
Aves	Passeriformes	Thamnophilidae	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Aves	Passeriformes	Thraupidae	0	1	2	0	1	0	0	1	2	1	3	1	1	2	10
Aves	Passeriformes	Turdidae	0	1	1	1	2	1	0	1	1	2	2	1	1	1	12
Aves	Passeriformes	Tyrannidae	0	2	2	1	1	2	0	2	1	3	3	0	1	0	10
Aves	Passeriformes	Vireonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Aves	Pelecaniformes	Ardeidae	0	1	3	0	0	0	0	2	1	2	0	2	1	0	7
Aves	Pelecaniformes	Threskiornithidae	0	1	0	0	0	0	0	1	0	1	1	0	1	0	5
Aves	Piciformes	Picidae	0	0	1	0	0	0	0	0	0	0	0	1	2	0	3
Aves	Piciformes	Ramphastidae	0	0	1	1	1	1	0	0	1	2	1	1	1	1	10
Aves	Procellariiformes	Diomedeidae	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Aves	Psittaciformes	Psittacidae	0	1	0	0	0	0	0	2	0	0	0	1	0	0	3
Aves	Rheiformes	Rheidae	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Aves	Suliformes	Phalacrocoracidae	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Aves	Tinamiformes	Tinamidae	0	0	0	0	1	0	0	0	1	0	1	1	1	3	6
Aves	Trogoniformes	Trogonidae	0	0	1	0	0	1	0	0	0	0	1	0	2	0	4
Mammalia	Artiodactyla	Tayassuidae	0	0	0	1	4	0	1	2	3	4	2	0	0	1	8
Mammalia	Carnivora	Canidae	0	0	1	0	0	0	0	0	0	1	1	0	1	0	4
Mammalia	Carnivora	Mustelidae	1	1	0	0	1	1	0	1	1	1	1	1	1	2	11
Mammalia	Carnivora	Procyonidae	0	0	1	0	0	0	0	0	0	1	1	0	0	1	4
Mammalia	Chiroptera	Phyllostomidae	0	0	0	0	0	1	0	0	2	1	1	0	0	3	5
Mammalia	Chiroptera	Vespertilionidae	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Mammalia	Cingulata	Dasypodidae	0	1	0	0	0	0	0	0	0	3	2	1	1	0	5
Mammalia	Didelphimorphia	Didelphidae	0	0	2	1	1	2	0	3	0	3	1	1	3	2	10
Mammalia	Perissodactyla	Equidae	0	1	1	0	0	0	1	0	0	0	0	0	0	0	3
Mammalia	Perissodactyla	Tapiridae	0	1	1	0	1	0	0	1	1	1	1	1	1	1	10
Mammalia	Pilosa	Myrmecophagidae	0	0	3	0	1	0	0	1	1	2	1	2	1	1	9
Mammalia	Primates	Atelidae	0	0	1	0	0	0	0	0	0	1	1	0	1	1	5
Mammalia	Primates	Cebidae	0	0	1	1	1	1	0	0	0	1	1	1	1	1	9
Mammalia	Rodentia	Caviidae	0	1	1	1	0	1	1	1	1	2	1	1	3	2	12
Mammalia	Rodentia	Cricetidae	0	1	2	0	2	1	0	2	1	3	2	2	2	3	11
Mammalia	Rodentia	Dasyproctidae	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Mammalia	Rodentia	Erethizontidae	0	0	1	0	0	0	0	0	0	1	0	0	1	0	3

Mammalia	Rodentia	Muridae	0	0	1	0	1	0	0	0	0	0	0	0	0	0	2
Mammalia	Rodentia	Myocastoridae	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Reptilia	Crocodylia	Alligatoridae	0	0	0	0	0	0	0	1	0	1	1	0	0	0	3
Reptilia	Squamata	Gymnophthalmidae	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Reptilia	Testudines	Chelidae	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2
Reptilia	Testudines	Testudinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1



Taxon richness among samples.

Sample ID	Class	Order	Family	Genus	Taxa (Species)
CR-AQU07	2	6	22	52	90 (36)
CR-LP01	1	4	16	38	63 (26)
GA-HU02	4	10	15	18	29 (12)
GA-HU05	2	6	14	18	27 (12)
GA-PIT24	3	7	11	12	18 (8)
GA-TRM46	3	8	17	27	47 (18)
GA-TRM61	3	9	20	27	44 (16)
HE-HER02	5	13	22	29	48 (18)
HE-HER05	4	9	18	22	31 (14)
HE-HER06	4	10	22	30	46 (18)
HE-HER07	4	13	23	34	50 (20)
HE-HER08	4	14	26	37	51 (25)
HE-HER09	3	8	16	22	44 (15)
HE-HU08	4	9	12	10	14 (9)
HE-HU09	2	2	3	2	4 (2)
HE-HU10	4	7	9	8	10 (7)
HE-HU11	4	8	10	10	12 (7)
HE-HU12	4	6	8	8	9 (4)
HE-HU13	4	6	11	12	17 (7)
HE-HU14	4	5	8	8	12 (5)
HE-TRM03	3	7	13	13	23 (8)
HE-TRM07	4	9	19	26	41 (11)
LB-AQU06	2	7	24	49	84 (34)
LB-LBSN03	4	9	22	35	54 (17)
MC-PIT33	3	9	18	30	51 (18)
MC-PIT34	3	15	23	30	42 (16)
MC-PIT43	4	15	23	29	43 (19)
MJ-HU14	4	8	14	19	28 (14)
MJ-HU16	3	10	18	28	49 (19)
MJ-TRM55	4	10	26	41	63 (24)
MJ-TRM62	4	9	19	23	39 (16)
MJ-TRM63	3	11	19	29	51 (20)
RZ-HU23	3	10	15	14	19 (10)
RZ-NAC01	2	7	10	9	13 (6)
RZ-NAC02	4	13	19	19	23 (12)
RZ-TRM64	1	4	12	18	31 (7)
SL-CHA07	3	6	14	26	40 (19)
SL-HU11	4	8	11	13	16 (12)

SL-HU12	4	10	14	23	29 (15)
SL-HU24	2	6	10	9	13 (6)
SL-TRM07	3	8	17	24	39 (15)
SL-TRM10	4	11	19	28	37 (17)
SL-TRM57	3	6	12	13	16 (8)
SL-TRM58	3	10	21	34	50 (20)
SL-TRM59	4	11	18	26	35 (19)
SL-TRM60	4	11	16	19	24 (13)
SO-HU21	4	9	12	14	18 (9)
SO-HU22	3	5	7	7	7 (4)
SO-LAG08	3	9	11	11	13 (6)
SO-LAG10	3	11	21	28	45 (17)
SO-LAG12	3	8	15	19	33 (10)
SO-LAG18	1	4	8	12	21 (7)
SO-PIT02	4	12	18	24	33 (15)
SO-PIT07	4	5	11	12	16 (8)
ST-HU08	1	4	8	13	17 (9)
ST-HU09	4	7	12	17	22 (13)
ST-HU10	2	6	12	19	26 (14)
ST-HU20	3	7	19	34	66 (17)
ST-HU25	3	9	11	15	18 (12)
ST-HU26	2	4	12	14	20 (11)
ST-NAP01	2	10	26	46	78 (26)
ST-NAP03	4	16	38	57	87 (33)
ST-NAP04	4	14	32	51	82 (30)
ST-NAP05	4	13	31	49	80 (28)
ST-NAP06	4	11	24	39	65 (22)
ST-NAP08	4	7	13	20	24 (14)
ST-NAP09	4	8	11	14	18 (9)
ST-NAP13	2	7	14	18	31 (11)
ST-NAP16	2	4	10	11	17 (6)
ST-NAP17	3	5	9	13	18 (8)
ST-NAP19	3	6	14	25	43 (10)
ST-NAP21	3	15	36	55	85 (28)
ST-NEG18	2	8	24	44	81 (28)
ST-NEG21	4	11	29	44	66 (28)
ST-NEG23	3	9	20	31	50 (19)
ST-NEG24	3	13	30	53	88 (35)
ST-NEG25	4	12	21	25	33 (16)
ST-NEG26	4	13	29	49	79 (30)
ST-NEG30	2	7	15	21	28 (12)
ST-NEG33	4	14	31	48	82 (28)
STSL-CHA10	3	5	8	10	14 (6)
TR-HU03	3	9	18	32	51 (23)
TR-HU15	3	9	14	19	26 (11)
TR-TRM20	3	9	19	27	47 (14)

TR-TRM21	3	6	9	16	20 (13)
TR-TRM22	3	7	15	25	35 (15)
TR-TRM24	4	13	20	25	31 (14)
TR-TRM28	3	8	21	37	62 (24)
TR-TRM30	4	9	24	39	62 (22)
TR-TRM31	4	17	26	29	45 (23)
VS-LAG05	4	15	24	35	53 (18)
VS-LAG07	3	9	16	23	31 (14)
VS-LAG16	4	15	24	33	52 (24)
VS-LAG17	4	12	20	26	46 (16)
VS-PIT42	2	6	17	30	50 (15)
ZA-NEG07	3	9	14	18	23 (11)
ZA-NEG08	4	14	32	50	77 (32)
ZA-NEG09	3	10	27	47	70 (27)
ZA-NEG12	4	13	30	48	82 (28)
ZA-NEG14	2	6	16	26	37 (18)
ZA-NEG34	4	15	32	52	84 (30)
ZA-NEG35	3	12	31	51	81 (29)
ZA-NEG36	4	15	33	49	80 (31)
ZA-NEG37	2	4	11	20	32 (14)
ZM-HU13	4	5	8	9	10 (7)
ZM-HU17	3	5	9	11	17 (10)
ZM-HU18	2	5	10	13	22 (8)
ZM-HU19	2	2	3	4	5 (2)
ZM-PIT18	1	5	12	19	33 (9)
ZM-PIT23	4	10	18	23	32 (14)
ZM-PIT28	4	14	29	39	59 (22)
ZM-TRM39	3	8	15	20	26 (14)
ZM-TRM41	4	8	14	15	24 (10)
ZM-TRM44	3	9	14	18	28 (11)
ZM-TRM45	5	13	20	22	28 (15)



Family frequency among samples.

Class	Order	Family	CR-AQU07	CR-LP01	GA-HU02	GA-HU05	GA-PIT24	GA-TRM46	GA-TRM61	HE-HER02	HE-HER05	HE-HER06	HE-HER07	HE-HER08	HE-HER09	HE-HU08	HE-HU09	HE-HU10	HE-HU11	HE-HU12	HE-HU13	HE-HU14
Actinopterygii	Characiformes	Acestrorhynchidae	0	1	0	0	0	1	1	0	1	0	0	1	1	0	0	0	0	0	0	0
Actinopterygii	Characiformes	Anostomidae	6	4	0	1	0	1	1	2	2	1	2	2	1	0	0	0	0	0	0	0
Actinopterygii	Characiformes	Characidae	10	14	7	9	2	15	9	8	3	9	10	9	9	1	1	1	2	2	5	1
Actinopterygii	Characiformes	Crenuchidae	1	1	1	0	0	1	1	1	1	1	1	1	1	1	0	0	0	1	1	0
Actinopterygii	Characiformes	Curimatidae	4	2	2	1	2	2	1	1	1	1	2	1	1	0	0	0	0	0	0	0
Actinopterygii	Characiformes	Erythrinidae	4	4	2	2	2	3	2	2	1	2	1	1	2	2	2	1	2	1	2	1
Actinopterygii	Characiformes	Iguanodectidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Actinopterygii	Characiformes	Prochilodontidae	1	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
Actinopterygii	Characiformes	Serrasalminidae	6	2	1	1	1	1	1	0	1	1	0	1	1	1	0	1	1	0	1	1
Actinopterygii	Cypriniformes	Cyprinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Actinopterygii	Gymnotiformes	Apterontidae	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Actinopterygii	Gymnotiformes	Gymnotidae	1	1	3	2	2	1	1	2	1	1	2	1	1	0	0	0	1	0	0	0
Actinopterygii	Gymnotiformes	Hypopomidae	0	0	2	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Actinopterygii	Gymnotiformes	Rhampichthyidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Actinopterygii	Gymnotiformes	Sternopygidae	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Actinopterygii	Perciformes	Centrarchidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Actinopterygii	Perciformes	Cichlidae	1	3	2	3	1	2	1	1	2	2	2	2	1	0	0	0	1	1	2	0
Actinopterygii	Perciformes	Sciaenidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Actinopterygii	Siluriformes	Auchenipteridae	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Actinopterygii	Siluriformes	Callichthyidae	2	2	1	1	3	1	2	4	4	4	4	4	3	1	0	1	0	0	1	0
Actinopterygii	Siluriformes	Cetopsidae	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Actinopterygii	Siluriformes	Doradidae	5	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Actinopterygii	Siluriformes	Heptapteridae	6	2	0	1	1	1	3	5	2	3	3	3	6	0	0	0	0	0	1	0
Actinopterygii	Siluriformes	Loricariidae	14	9	0	1	0	2	7	6	4	7	6	5	9	0	0	0	0	0	1	0
Actinopterygii	Siluriformes	Pimelodidae	7	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Actinopterygii	Siluriformes	Pseudopimelodidae	2	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0
Actinopterygii	Siluriformes	Trichomycteridae	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
Actinopterygii	Synbranchiformes	Synbranchidae	1	0	1	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0
Amphibia	Anura	Bufoinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amphibia	Anura	Dicroglossidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amphibia	Anura	Hylidae	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	2	1	1	1	4
Amphibia	Anura	Leptodactylidae	0	0	1	0	0	0	0	1	0	1	2	3	0	0	0	0	0	0	0	2
Amphibia	Anura	Odontophrynidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amphibia	Anura	Phyllomedusidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amphibia	Anura	Ranidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amphibia	Gymnophiona	Siphonopidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aves	Accipitriformes	Accipitridae	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Aves	Accipitriformes	Cathartidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aves	Anseriformes	Anatidae	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	1	1	0
Aves	Caprimulgiformes	Caprimulgidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aves	Charadriiformes	Charadriidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aves	Charadriiformes	Jacaniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0
Aves	Charadriiformes	Scolopacidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aves	Columbiformes	Columbidae	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0
Aves	Coraciiformes	Alcedinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aves	Cuculiformes	Cuculidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Aves	Galliformes	Cracidae	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0
Aves	Gruiformes	Rallidae	0	0	0	1	2	0	0	0	1	0	0	1	1	0	0	0	0	0	0	1
Aves	Passeriformes	Campephagidae	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Aves	Passeriformes	Cardinalidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aves	Passeriformes	Corvidae	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Aves	Passeriformes	Furnariidae	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Aves	Passeriformes	Thamnophilidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aves	Passeriformes	Thraupidae	0	0	0	1	0	1	0	1	0	1	1	0	0	0	0	0	0	0	1	0
Aves	Passeriformes	Turdidae	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0
Aves	Passeriformes	Tyrannidae	0	0	1	1	0	2	0	0	0	0	0	1	0	0	0	0	1	0	0	0
Aves	Passeriformes	Vireonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aves	Pelecaniformes	Ardeidae	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0
Aves	Pelecaniformes	Threskiornithidae	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Aves	Piciformes	Picidae	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Aves	Piciformes	Ramphastidae	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Aves	Procellariiformes	Diomedidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Aves	Psittaciformes	Psittacidae	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Aves	Rheiformes	Rheidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aves	Suliformes	Phalacrocoracidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aves	Tinamiformes	Tinamidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aves	Trogoniformes	Trogonidae	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Mammalia	Artiodactyla	Tayassuidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mammalia	Carnivora	Canidae	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Mammalia	Carnivora	Mustelidae	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Mammalia	Carnivora	Procyonidae	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Mammalia	Chiroptera	Phyllostomidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mammalia	Chiroptera	Vespertilionidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mammalia	Cingulata	Dasypodidae	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mammalia	Didelphimorphia	Didelphidae	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0
Mammalia	Perissodactyla	Equidae	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Mammalia	Perissodactyla	Tapiridae	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mammalia	Pilosa	Myrmecophagidae	0	0	0	0	0	0	2	0	1	2	1	2	0	0	0	0	0	0	0	0
Mammalia	Primates	Atelidae	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Mammalia	Primates	Cebidae	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0
Mammalia	Rodentia	Caviidae	0	0	1	0	0	1	0	0	1	1	1	1	0	1	1	0	1	0	1	1
Mammalia	Rodentia	Cricetidae	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0
Mammalia	Rodentia	Dasyproctidae	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Mammalia	Rodentia	Erethizontidae	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0
Mammalia	Rodentia	Muridae	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Mammalia	Rodentia	Myocastoridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reptilia	Crocodylia	Alligatoridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reptilia	Squamata	Gymnophthalmidae	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Reptilia	Testudines	Chelidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reptilia	Testudines	Testudinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

HE-TRM03	HE-TRM07	LB-AQU06	LB-LBSN03	MC-PIT33	MC-PIT34	MC-PIT43	MJ-HU14	MJ-HU16	MJ-TRM55	MJ-TRM62	MJ-TRM63	n samples	RZ-HU23	RZ-NAC01	RZ-NAC02	RZ-TRM64	SL-CHA07	SL-HU11	SL-HU12	SL-HU24	SL-TRM07	SL-TRM10	SL-TRM57
0	0	1	1	0	0	0	0	1	1	0	1	37	0	0	0	0	0	0	0	0	1	0	0
0	0	8	1	1	0	0	1	3	2	1	1	78	0	0	1	1	2	0	1	0	1	1	1
2	10	15	9	16	3	7	7	14	10	7	12	112	2	1	3	8	7	0	10	2	8	12	5
1	1	1	1	1	1	1	0	1	1	0	1	85	1	1	1	1	0	1	0	0	1	0	1
1	1	3	1	1	1	2	1	2	1	1	1	92	0	1	1	1	1	0	0	0	2	2	1
1	1	2	4	2	2	1	3	4	2	1	4	109	2	2	1	0	1	1	1	2	3	1	1
0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	0	1	1	1	0	53	0	0	0	1	1	0	0	1	1	0	0
1	1	2	0	0	0	1	1	1	1	1	1	90	1	1	1	0	3	0	2	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	0	0	0	0	0	19	0	0	0	0	0	0	0	0	0	0	0
3	1	1	2	1	1	1	2	0	1	2	2	80	2	1	0	0	0	0	0	1	0	2	1
0	0	0	1	0	0	0	2	0	1	0	0	29	1	0	1	1	0	0	1	2	0	1	0
0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0
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4	3	1	2	2	4	3	2	1	0	2	3	74	0	0	0	0	0	0	0	1	1	3	0
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0	0	4	0	0	0	0	0	0	0	0	0	18	0	0	0	0	0	0	0	0	0	0	0
2	6	5	2	6	5	5	0	1	4	3	3	85	0	1	1	3	3	0	0	0	1	1	1
0	5	13	8	5	5	0	0	2	10	1	5	72	0	0	0	4	7	0	1	0	2	2	0
0	0	4	0	0	0	0	0	0	1	0	0	25	0	0	0	0	3	0	0	0	0	0	0
0	1	2	1	1	1	0	0	0	1	0	0	35	0	0	0	1	0	0	0	0	0	0	0
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Sample	Family	Genus	Species	Proportion
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100



Fields included in the attached shapefile (Paracel_101890.richness_summary.*).

Field	Description
NMID	Unique sample number used by NatureMetrics
Sample_ID	Sample ID provided by client
Long	Longitude provided by client (decimal degrees)
Lat	Latitude provided by client (decimal degrees)
Property	Property at which sample was taken
Property_code	2-letter code for the Property
Taxa	Total number of taxa (OTUs) in the sample
Species	Total number of taxa identified to species in the sample
Fish	Total number of taxa identified as fish in the sample
Amphibian	Total number of taxa identified as amphibians in the sample
Bird	Total number of taxa identified as birds in the sample
Mammal	Total number of taxa identified as mammals in the sample
Reptile	Total number of taxa identified as reptiles in the sample
Redlist_NT_VU	Total number of Red List species detected in the sample (Near Threatened and Vulnerable categories)
NearThreatened	Total number of Near Threatened species detections in the sample
Vulnerable	Total number of Vulnerable species detections in the sample
Alouatta_caraya	Presence/absence of Alouatta caraya in the sample (NT)
Amazona_aestiva	Presence/absence of Amazona aestiva in the sample (NT)
Cabassous_chacoensis	Presence/absence of Cabassous chacoensis in the sample (NT)
Lontra_longicaudis	Presence/absence of Lontra longicaudis in the sample (NT)
Myrmecophaga_tridactyla	Presence/absence of Myrmecophaga tridactyla in the sample (VU)
Rhea_americana	Presence/absence of Rhea americana in the sample (NT)
Tapirus_terrestris	Presence/absence of Tapirus terrestris in the sample (VU)
Tayassu_pecari	Presence/absence of Tayassu pecari in the sample (VU)

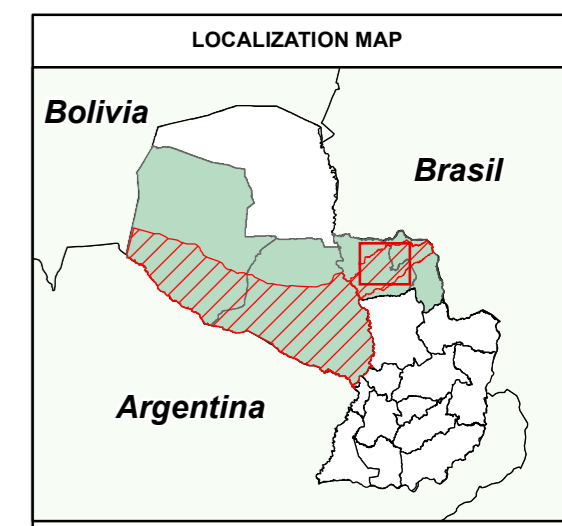
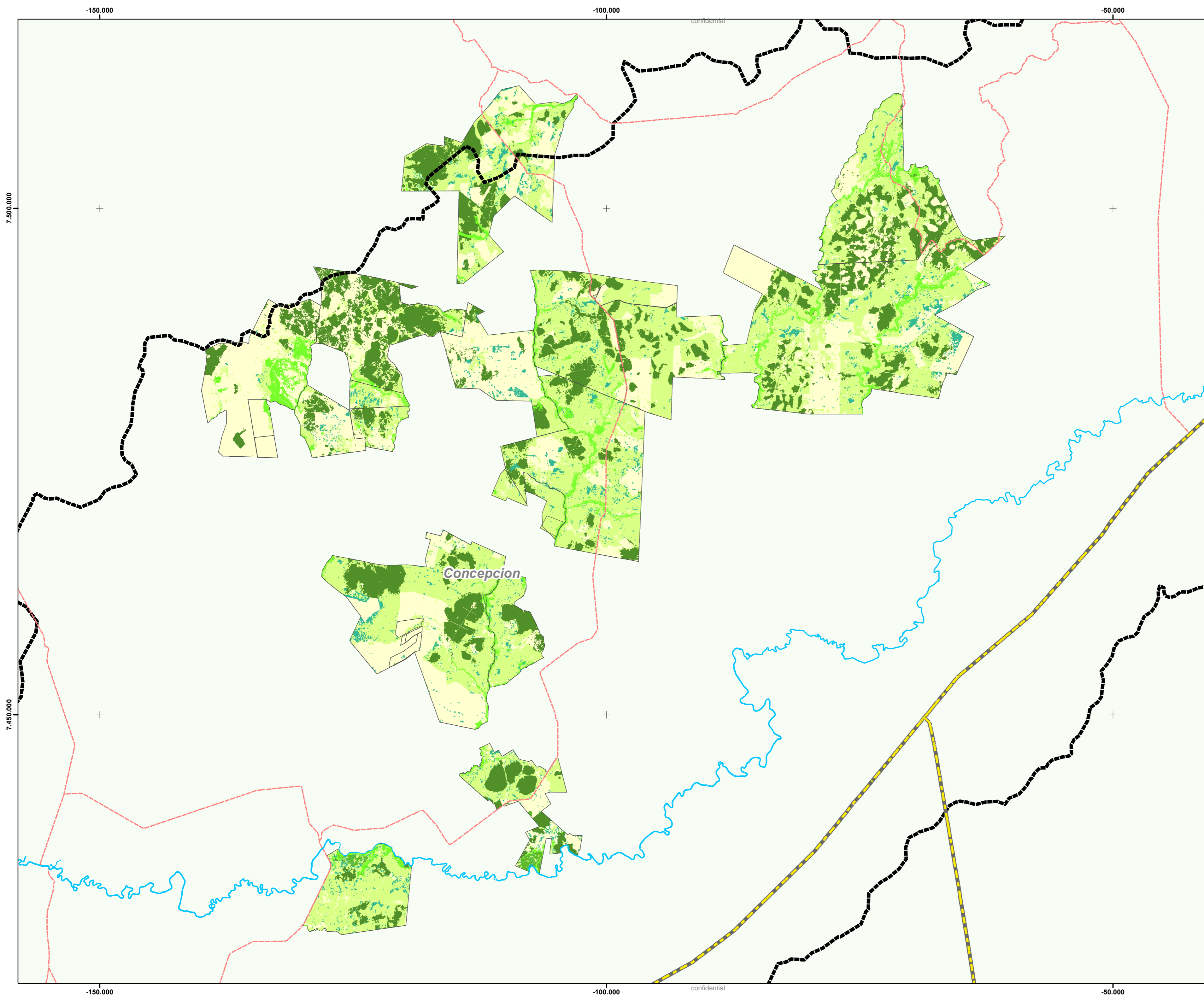


The volume of water filtered and the resultant concentration of purified DNA and index PCRs.

Sample ID	Volume filtered	Date arrived	DNA (ng/μl)	Index (ng/μl) ²	Sample ID provided on Sample Sheet	Property
CR-AQU07	1350 ml	19/abr/21	35,8	4,7	LB-AQU07	Cristo Rey
CR-LP01	400 ml	19/abr/21	5,78	12,3	CR-LP-01	Cristo Rey
GA-HU02	500 ml	19/abr/21	11,4	10,3	GA-HU02 HU04	Gavilan
GA-HU05	350 ml	19/abr/21	33,2	11,3	GA-HU05	Gavilan
GA-PIT24	610 ml	19/abr/21	9,06	4,42	PIT24-GA	Gavilan
GA-TRM46	570 ml	19/abr/21	30,8	11,9	GA-TRM46	Gavilan
GA-TRM61	800 ml	19/abr/21	41,2	10,6	GA-TRM61	Gavilan
HE-HER02	1200 ml	19/abr/21	17,5	8,04	HER02 (HE-HER02)	Hermosa
HE-HER05	1900 ml	19/abr/21	63	11,3	HE-HER05	Hermosa
HE-HER06	400 ml	19/abr/21	12	9,02	HE-HER06	Hermosa
HE-HER07	1200 ml	19/abr/21	44,8	12,4	HE-HER07	Hermosa
HE-HER08	1200 ml	19/abr/21	17,1	9,88	HE-HER08	Hermosa
HE-HER09	2000 ml	19/abr/21	43,4	11,2	HE-HER09	Hermosa
HE-HU08	200 ml	19/abr/21	7,06	4,92	HE-HU08	Hermosa
HE-HU09	700 ml	19/abr/21	2,78	10,2	HE-HU09	Hermosa
HE-HU10	670 ml	19/abr/21	46,6	10,1	HE-HU10	Hermosa
HE-HU12	450 ml	19/abr/21	5,88	11,8	HE-HU12 - Hermosa	Hermosa
HE-HU13	460 ml	19/abr/21	50,4	12,1	HE-HU13	Hermosa
HE-HU14	450 ml	19/abr/21	19,8	6,2	HE-HU14	Hermosa
HE-HU11	330 ml	19/abr/21	20,2	11,1	HE-HU11	Hermosa
HE-TRM03	220 ml	19/abr/21	16,5	0,77	HE-TRM03	Hermosa
HE-TRM07	2000 ml	19/abr/21	15,7	13,6	HE-TRM07	Hermosa
LB-AQU06	1700 ml	19/abr/21	20,4	3,38	LB-AQU06	La Blanca
LB-LBSN03	1000 ml	19/abr/21	33,8	11,3	LBSN03	La Blanca
MC-PIT33	2000 ml	19/abr/21	32	10,7	MC-PIT33	Machuca Cue
MC-PIT34	500 ml	19/abr/21	22	6,38	MC-PIT34	Machuca Cue
MC-PIT43	1200 ml	19/abr/21	1,42	11,1	PIT32-MC	Machuca Cue
MJ-HU14	170 ml	19/abr/21	20,2	10,7	MJ-HU14	Mandiyu
MJ-HU16	550 ml	19/abr/21	132	11,3	MJHU16	Mandiyu
MJ-TRM55	600ml	19/abr/21	7,08	9,4	TRM55	Mandiyu
MJ-TRM62	800 ml	19/abr/21	14,2	10,8	MJ-TRM62	Mandiyu
MJ-TRM63	300 ml	19/abr/21	28,2	11,6	MJ-TRM63	Mandiyu
RZ-HU23	230 ml	19/abr/21	43,8	2,94	RZ-HU23	Rancho Z
RZ-NAC01	190 ml	19/abr/21	54,2	11,9	RZ-NAC01	Rancho Z
RZ-NAC02	650 ml	19/abr/21	55,8	11,2	RZ-NAC02	Rancho Z
RZ-TRM64	500 ml	19/abr/21	< 0.01	8,4	Rz TRM64	Rancho Z
SL-CHA07	515 ml	19/abr/21	2,28	10,6	SL-CHA07	San Liberato
SL-HU11	400 ml	19/abr/21	48,6	10,7	SL-HU11	San Liberato
SL-HU12	690 ml	19/abr/21	11	11,3	HU12 - SL	San Liberato
SL-HU24	300 ml	19/abr/21	13,7	9,92	SL-HU24	San Liberato
SL-TRM07	500 ml	19/abr/21	5,56	10,5	SL-TRM07	San Liberato
SL-TRM10	220 ml	19/abr/21	10,9	9,18	ST-TRM10	San Liberato
SL-TRM57	350 ml	19/abr/21	19,5	11,6	SL-TRM57	San Liberato
SL-TRM58	1000 ml	19/abr/21	20,2	7,56	SL-TRM58	San Liberato
SL-TRM59	195 ml	19/abr/21	42,8	7,34	SL-TRM59	San Liberato
SL-TRM60	400 ml	19/abr/21	6,08	8,84	SL-TRM60	San Liberato
SO-HU21	1000 ml	19/abr/21	66,4	13,7	SO-HU21	Soledad
SO-HU22	400 ml	19/abr/21	50,6	10,8	SO-HU22	Soledad
SO-LAG08	1650 ml	19/abr/21	10,4	0,572	LAG08-50	Soledad
SO-LAG10	700 ml	19/abr/21	6,76	6,42	SO-LAG10	Soledad
SO-LAG12	1100 ml	19/abr/21	26,8	10,4	LAG12-50	Soledad
SO-LAG18	200 ml	19/abr/21	2,72	11,4	SO-LAG18	Soledad
SO-PIT02	400 ml	19/abr/21	36,8	9,54	SO-PIT02	Soledad
SO-PIT07	1000 ml	19/abr/21	23,8	8,78	SO-PIT07	Soledad
ST-HU08	140 ml	19/abr/21	3,28	11,1	ST-HU08	Santa Teresa
ST-HU09	300 ml	19/abr/21	12,8	10,4	ST-HU09	Santa Teresa
ST-HU10	300 ml	19/abr/21	8,8	11	ST-HU10	Santa Teresa
ST-HU20	800 ml	19/abr/21	6,86	12,8	ST-HU20	Santa Teresa
ST-HU25	300 ml	19/abr/21	17	8,52	ST-HU25	Santa Teresa
ST-HU26	70 ml	19/abr/21	6,14	10,3	ST-HU26	Santa Teresa
ST-NAP01	600 ml	19/abr/21	3,72	10,3	ST-NAP01	Santa Teresa
ST-NAP03	1400 ml	19/abr/21	9,76	2,94	ST-NAP03	Santa Teresa
ST-NAP04	1300 ml	19/abr/21	11,4	4,6	ST-NAP04	Santa Teresa
ST-NAP05	1200 ml	19/abr/21	9,36	6,42	ST-NAP05	Santa Teresa
ST-NAP06	1400 ml	19/abr/21	10,5	1,8	ST-NAP06	Santa Teresa
ST-NAP08	300 ml	19/abr/21	15,4	10,6	ST-NAP08	Santa Teresa
ST-NAP09	200 ml	19/abr/21	5,4	10,5	ST-NAP09	Santa Teresa
ST-NAP13	390 ml	19/abr/21	3,2	9,86	ST-NAP13	Santa Teresa
ST-NAP16	410 ml	19/abr/21	24,6	8,48	ST-NAP16	Santa Teresa
ST-NAP17	600 ml	19/abr/21	5,98	12,7	ST-NAP17	Santa Teresa
ST-NAP19	230 ml	19/abr/21	8,96	11,7	ST-NAP19	Santa Teresa
ST-NAP21	540 ml	19/abr/21	5,9	9,44	ST-NAP21	Santa Teresa
ST-NEG18	790 ml	19/abr/21	10	8,06	ST-NEG18	Santa Teresa
ST-NEG21	350 ml	19/abr/21	1,08	10,7	ST-NEG21	Santa Teresa
ST-NEG23	400 ml	19/abr/21	10,1	11,8	ST-NEG23	Santa Teresa
ST-NEG24	900 ml	19/abr/21	3,04	10,1	ST-NEG24	Santa Teresa
ST-NEG25	300 ml	19/abr/21	112	4,26	ST-NEG25	Santa Teresa
ST-NEG26	420 ml	19/abr/21	2,5	11,7	ST-NEG26	Santa Teresa
ST-NEG30	298 ml	19/abr/21	12,3	12,7	ST-NEG30	Santa Teresa
ST-NEG33	340 ml	19/abr/21	2,22	11	ST-NEG33	Santa Teresa
STSL-CHA10	600 ml	19/abr/21	10,3	9,08	SRSL CHA10	San Liberato
TR-HU03	800 ml	19/abr/21	74,6	12,3	TR-HU03	Trementina
TR-HU15	70 ml	19/abr/21	16,3	12,2	TR-HU15	Trementina
TR-TRM20	600 ml	19/abr/21	24,8	12,4	TR-TRM20	Trementina

TR-TRM21	200 ml	19/abr/21	112	10,5	TR-TRM21	Trementina
TR-TRM22	210 ml	19/abr/21	2,34	8,74	TRM22	Trementina
TR-TRM24	300 ml	19/abr/21	61,2	8,92	T-TRM24	Trementina
TR-TRM28	600 ml	19/abr/21	13,7	7,72	TR-TRM28	Trementina
TR-TRM30	700 ml	19/abr/21	10,8	11,6	TR-TRM30	Trementina
TR-TRM31	500 ml	19/abr/21	25,2	9,9	TR-TRM31	Trementina
VS-LAG05	550 ml	19/abr/21	24,4	11,3	LAG05-VS	Villa Sana
VS-LAG07	500 ml	19/abr/21	22,8	11,8	VS-LAG07	Villa Sana
VS-LAG16	1400 ml	19/abr/21	6,96	11,6	VS-LAG16	Villa Sana
VS-LAG17	1000 ml	19/abr/21	7,46	12,8	VS-LAG17	Villa Sana
VS-PIT42	1000 ml	19/abr/21	27,8	10,9	VS-PIT42	Villa Sana
ZA-NEG07	470 ml	19/abr/21	27,2	8,18	ZA-NEG070	Zapallo
ZA-NEG08	700 ml	19/abr/21	1,82	7,92	ZA-NEG08	Zapallo
ZA-NEG09	700 ml	19/abr/21	7,34	7,26	ZA-NEG09	Zapallo
ZA-NEG12	600 ml	19/abr/21	2,72	7,18	ZA-NEG12	Zapallo
ZA-NEG14	30 ml	19/abr/21	0,402	8,94	ZA-NEG14	Zapallo
ZA-NEG34	750 ml	19/abr/21	4,1	8,48	ZA-NEG34	Zapallo
ZA-NEG35	500 ml	19/abr/21	3,22	9,88	ZA-NEG35	Zapallo
ZA-NEG36	800 ml	19/abr/21	5,94	8,12	ZA-NEG36	Zapallo
ZA-NEG37	630 ml	19/abr/21	61,8	11,8	ZA-NEG37	Zapallo
ZM-HU13	550 ml	19/abr/21	5,46	11,2	ZM-HU13	Zanja Moroti
ZM-HU17	600 ml	19/abr/21	33,8	13,9	ZMHU17	Zanja Moroti
ZM-HU18	400 ml	19/abr/21	30,6	1,45	ZM-HU18	Zanja Moroti
ZM-HU19	300 ml	19/abr/21	15,3	8,74	ZM-HU19	Zanja Moroti
ZM-PIT18	1000 ml	19/abr/21	32,8	8,62	ZM-PIT18	Zanja Moroti
ZM-PIT23	1300 ml	19/abr/21	29	4,64	ZM-PIT23	Zanja Moroti
ZM-PIT28	1200 ml	19/abr/21	31,8	10,3	PIT28-ZM	Zanja Moroti
ZM-TRM39	350 ml	19/abr/21	15,5	11,2	ZM-TRM39	Zanja Moroti
ZM-TRM41	1000 ml	19/abr/21	4,24	3,7	ZM-TRM41	Zanja Moroti
ZM-TRM44	350 ml	19/abr/21	5,96	7,48	EM-TRM44	Zanja Moroti
ZM-TRM45	600 ml	19/abr/21	2	10,5	ZM-TRM45	Zanja Moroti

ANNEX III
Vegetation and Land Use Properties Maps



- LEGEND**
- ★ Capital
 - ~ Hydrography
 - ⚡ Main Highways
 - ~ Secondary Highways
 - Properties
 - ▨ ADA - Directly Affected Area
 - ▧ Easement Lane
 - ⬛ CIH Rio Pilcomayo and Aquidaban
 - Properties
 - South America
- Landcover - Vegetation**
- Fragmented Forest
 - Herbacious Wetland
 - Moist Forest
 - Riparian Gallery Forest
 - Savannah
 - Subhumid Forest



DATUM SIRGAS 2000
PROJECTION: UTM

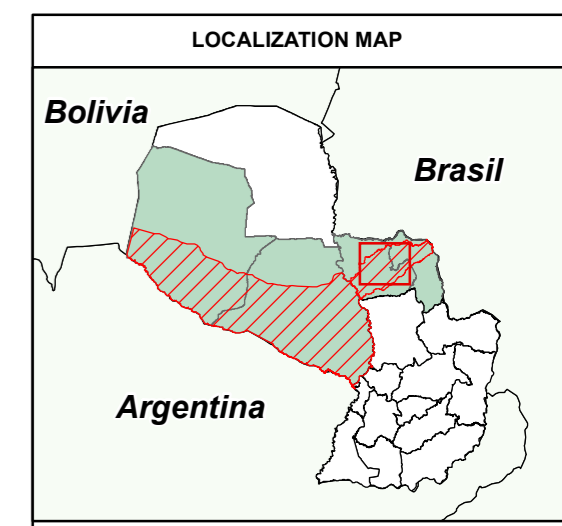
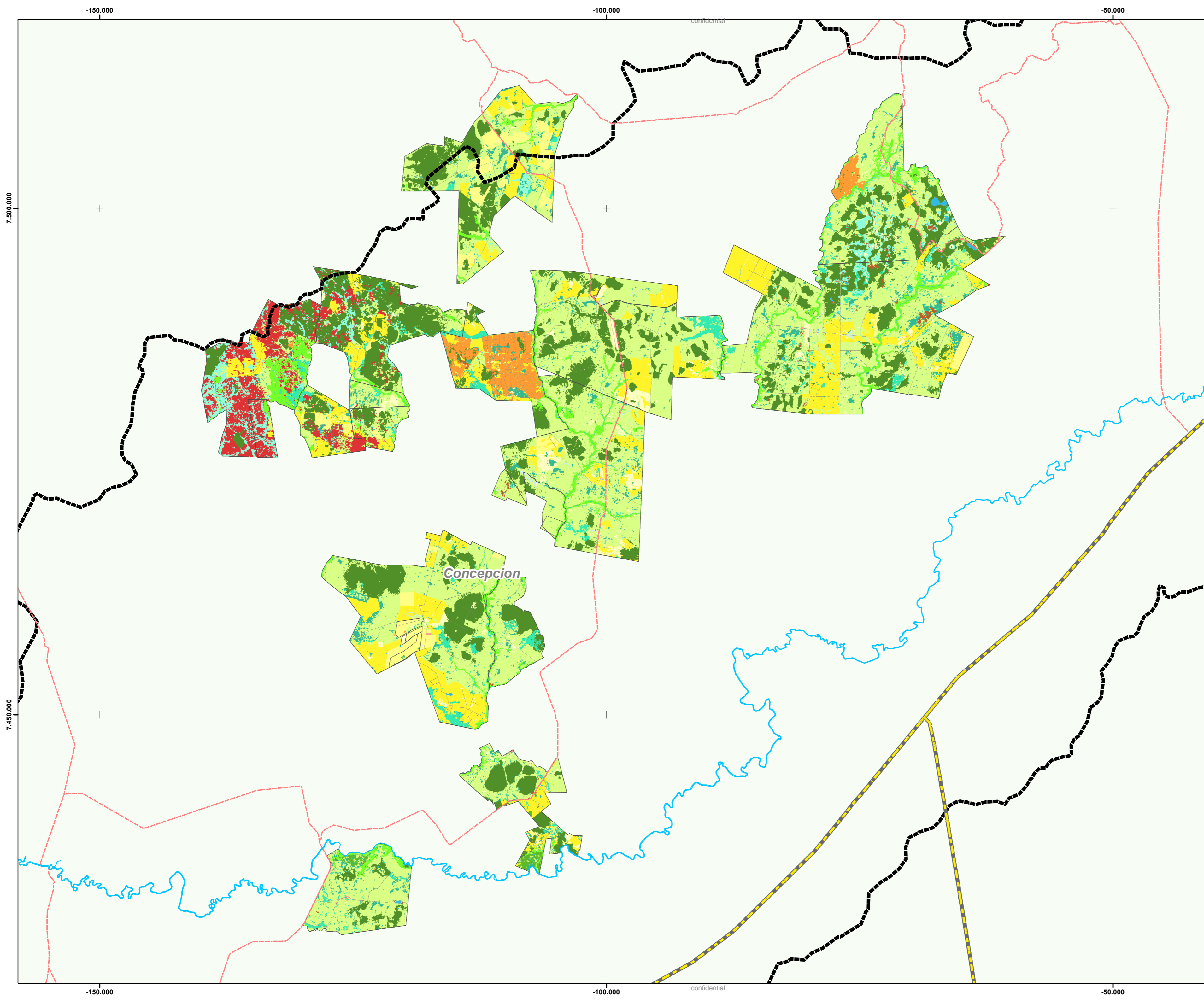
SOURCE:
- DGEEC, 2012 (Dirección General de Estadística, Encuestas y Censos).



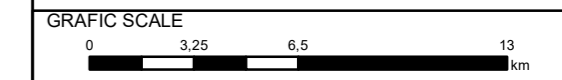
ENVIRONMENTAL IMPACT STUDY
CIH8 Aquidaban and CIH18 Rio Pilcomayo

VEGETATION OF PROPERTIES

SCALE: 1:235.403	DATE: 28/05/2021
PROJECT Nº: Figura 1	PAGE: 1/7
MANAGER: Romualdo Hirata	SIGNATURE: _____
REV: 0	



- LEGEND**
- ★ Capital
 - ~ Hydrography
 - ⚡ Main Highways
 - ~ Secondary Highways
 - Properties
 - ▨ ADA - Directly Affected Area
 - ▤ Easement Lane
 - ⊞ CIH Rio Pilcomayo and Aquidaban
 - Properties
 - South America
- Landcover**
- Agriculture
 - Cleared
 - Dark Burn or Water
 - Dry Riverbed
 - Fragmented Forest
 - Herbacious Wetland
 - Inundated / Veg/ Water
 - Manmade
 - Moist Forest
 - Pasture - African Grasses
 - Plantation
 - Riparian Gallery Forest
 - Road
 - Sand
 - Savannah
 - Seasonal Wetland
 - Shrubland
 - Subhumid Forest
 - Water
 - Wet Grasses



DATUM SIRGAS 2000
PROJECTION: UTM

SOURCE:
- DGEEC, 2012 (Dirección General de Estadística, Encuestas y Censos).



ENVIRONMENTAL IMPACT STUDY
CIH8 Aquidaban and CIH18 Rio Pilcomayo

LAND USE OF PROPERTIES

SCALE: 1:235.403	DATE: 28/05/2021
PROJECT Nº: Figura 1	PAGE: 1/7
MANAGER: Romualdo Hirata	SIGNATURE: _____
REV: 0	

ANNEX IV
Properties percentage land use

6.747

Cristo Rey

confidential

Total surface (ha)

Forestry-Environmental Analysis

FOREST MANAGEMENT

66%

4.476

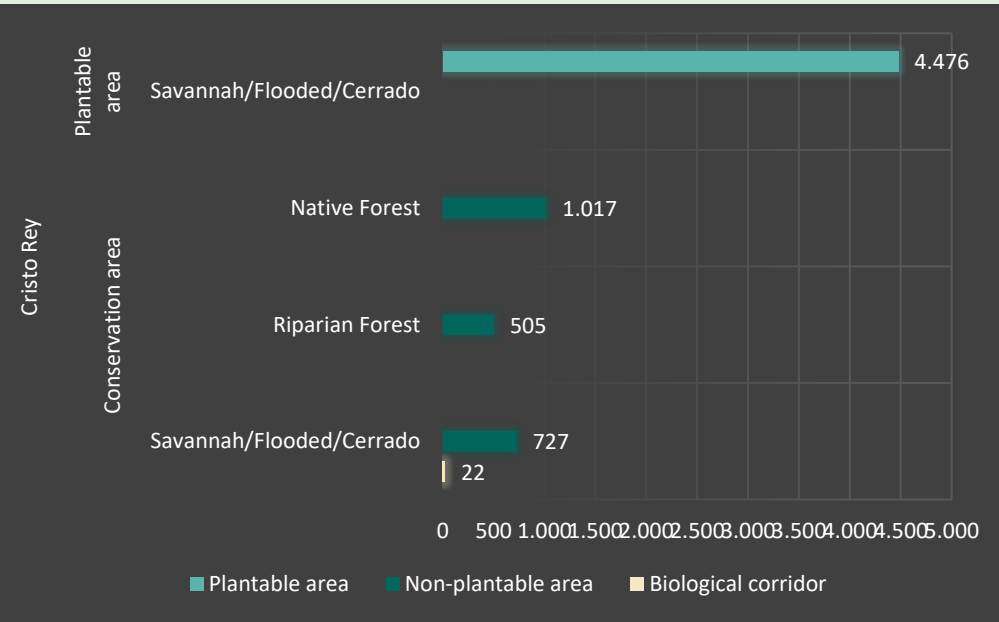
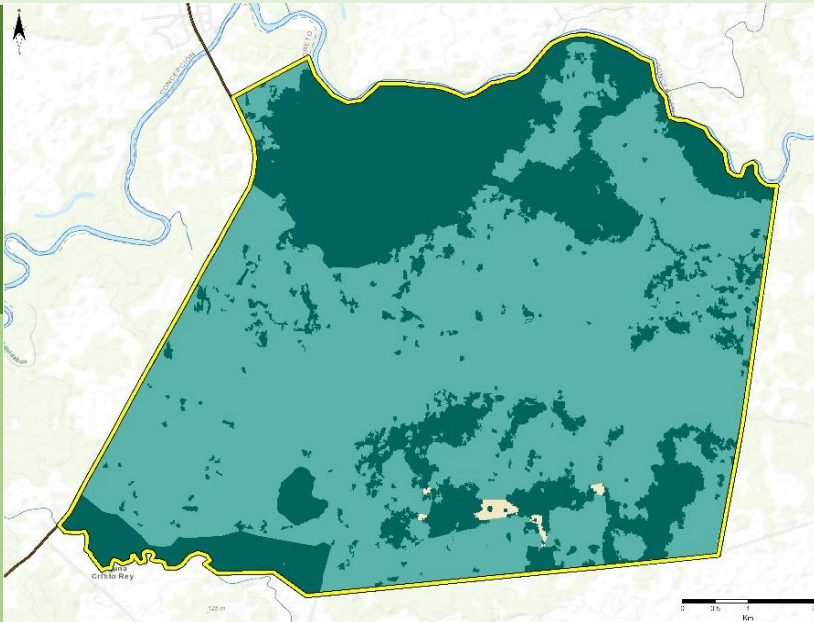
Plantable area



34%

2.271

Conservation area



LAND USE AND LAND COVER

1.017

Native Forest



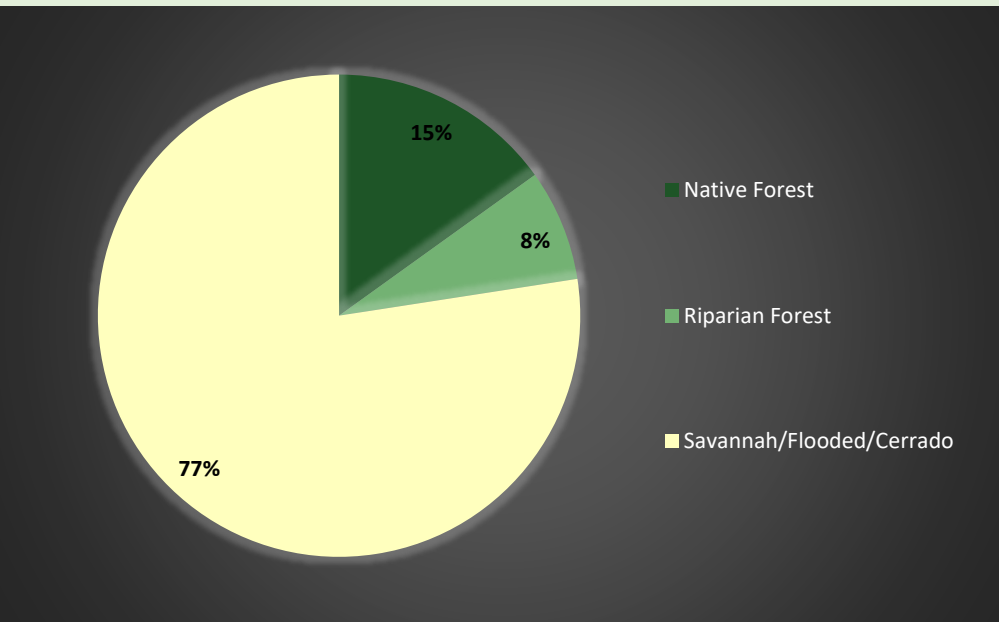
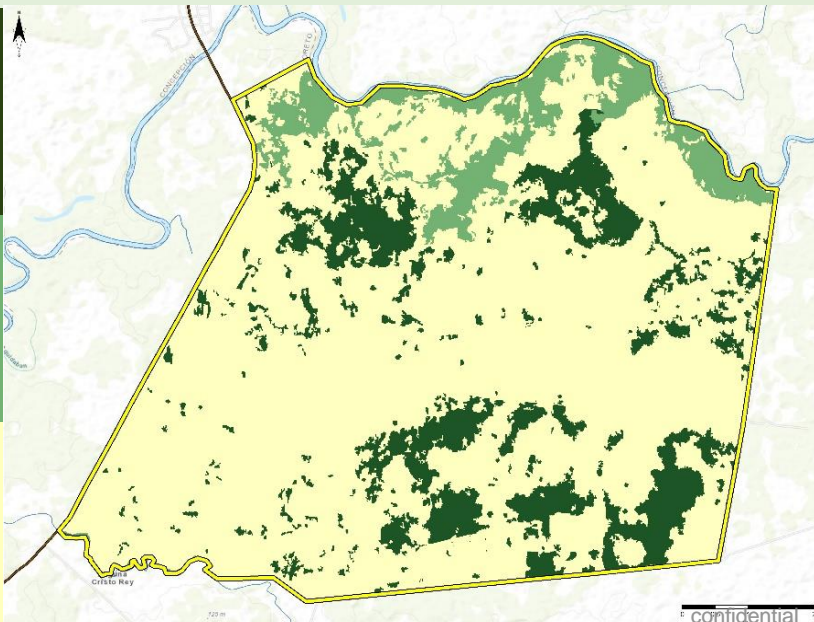
505

Riparian Forest



5.225

Savannah/Flooded/Cerrado



confidential

6.722

Gavilán

confidential



Total surface (ha)

Forestry-Environmental Analysis

FOREST MANAGEMENT

76%

5.116

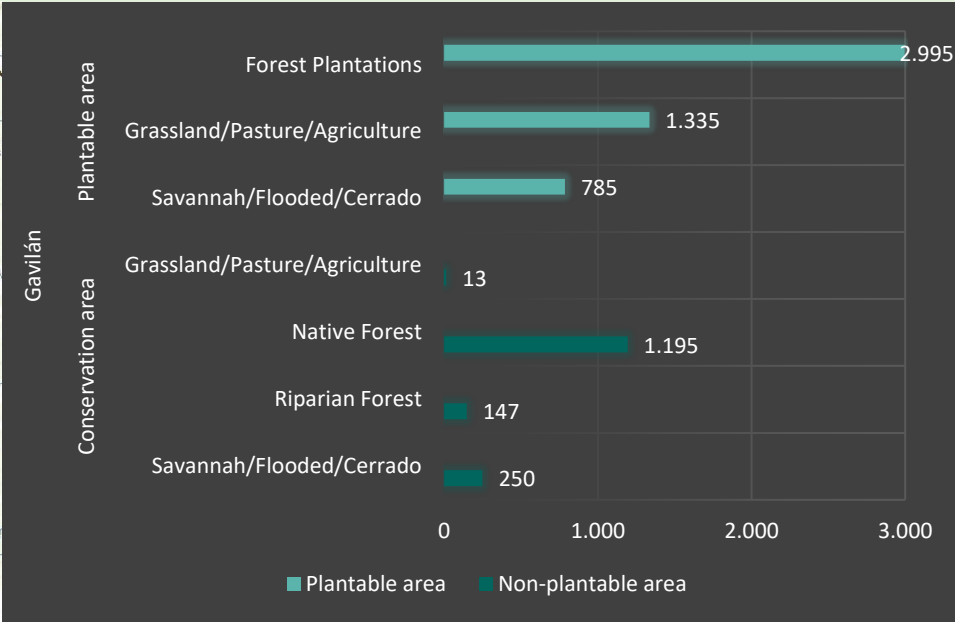
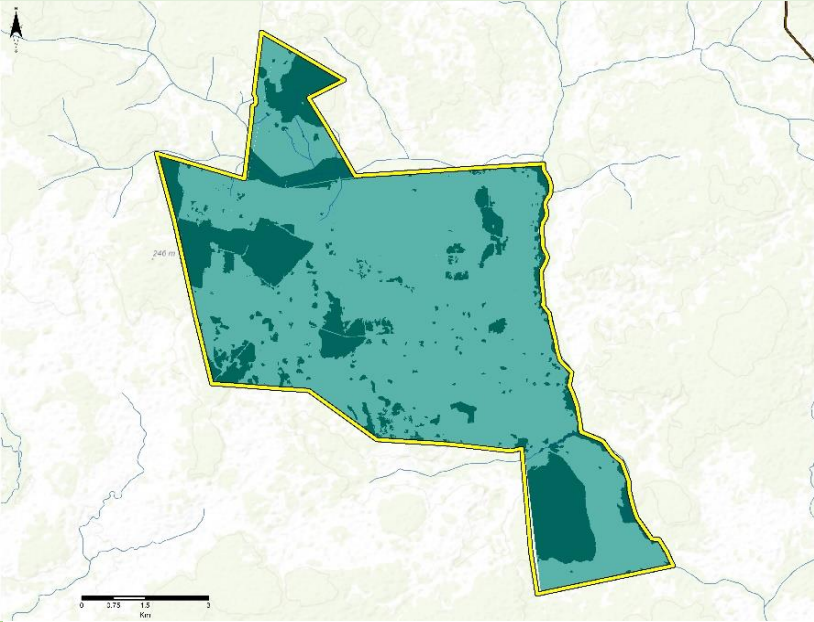
Plantable area



24%

1.605

Conservation area



LAND USE AND LAND COVER



1.195

Native Forest



147

Riparian Forest



1.035

Savannah/Flooded/Cerrado



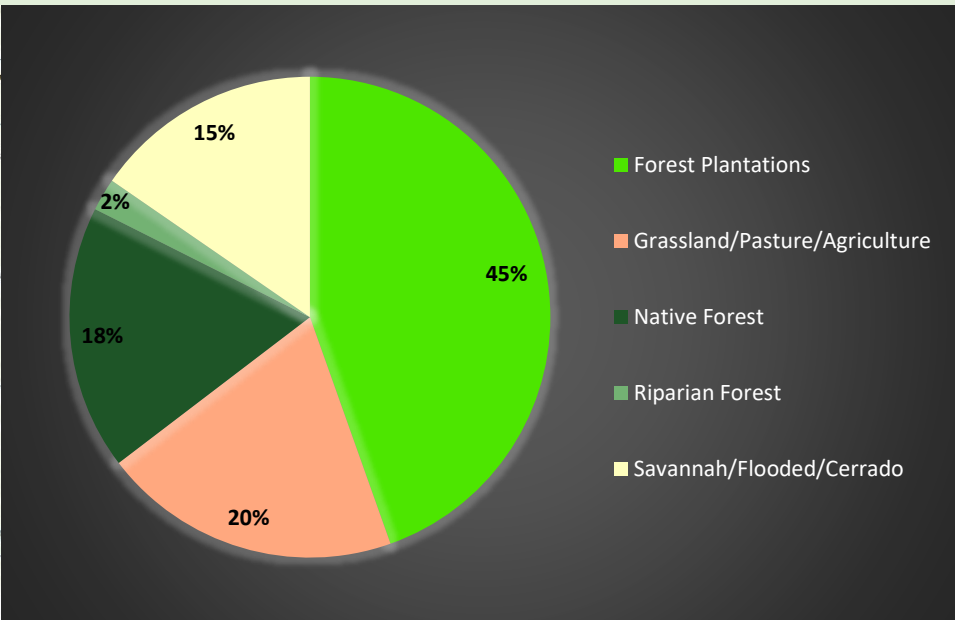
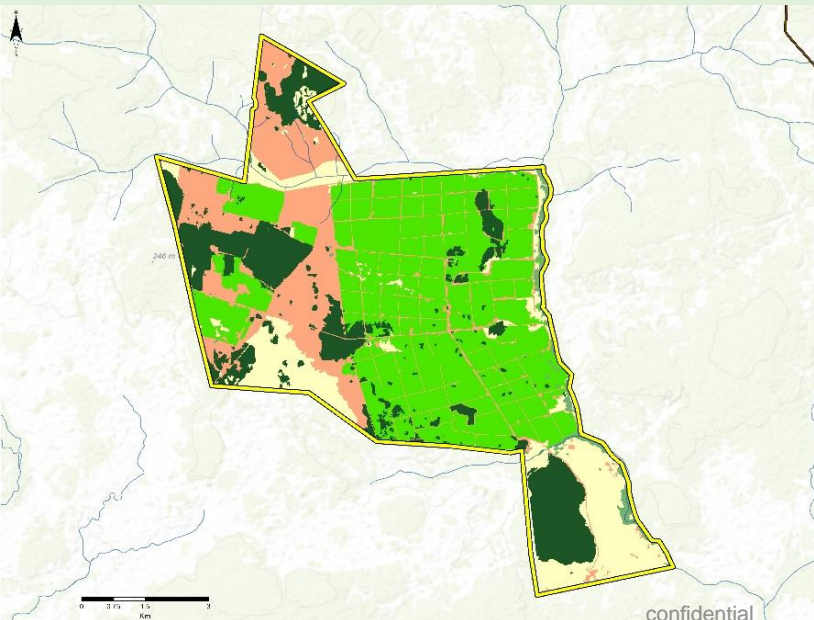
2.995

Forest Plantations



1.349

Grassland/Pasture/Agriculture



confidential

14.978

Hermosa

confidential

Total surface (ha)

Forestry-Environmental Analysis

FOREST MANAGEMENT

55%

8.198

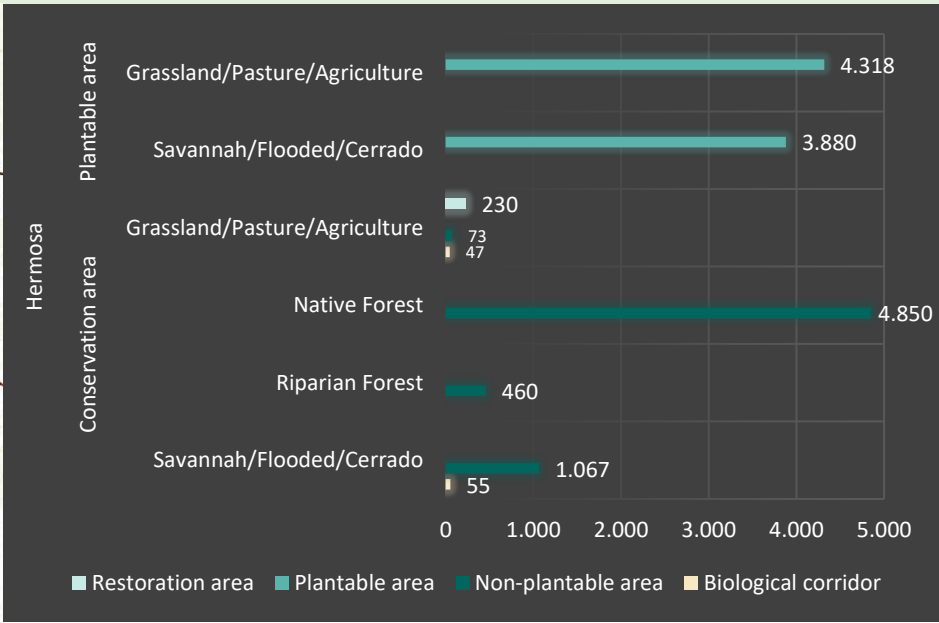
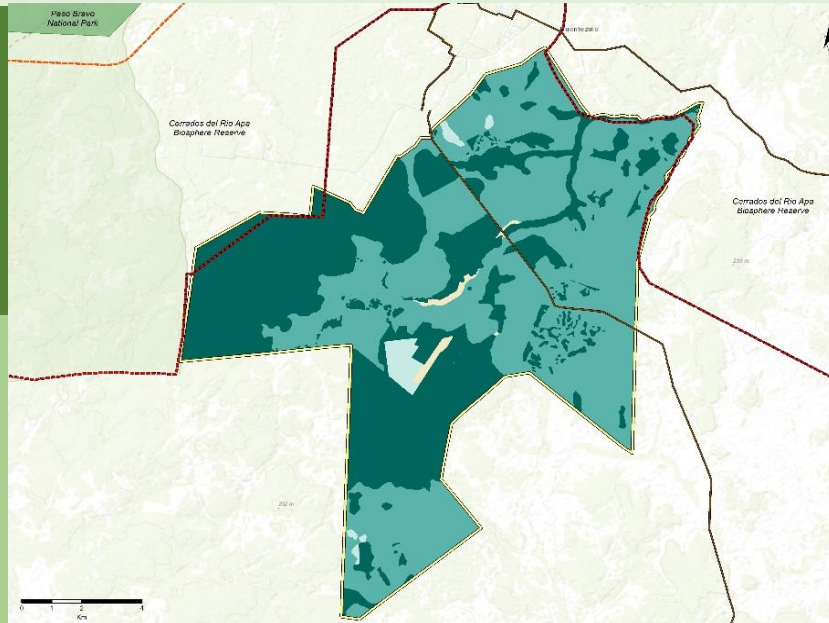
Plantable area



45%

6.780

Conservation area



LAND USE AND LAND COVER



4.850

Native Forest



460

Riparian Forest



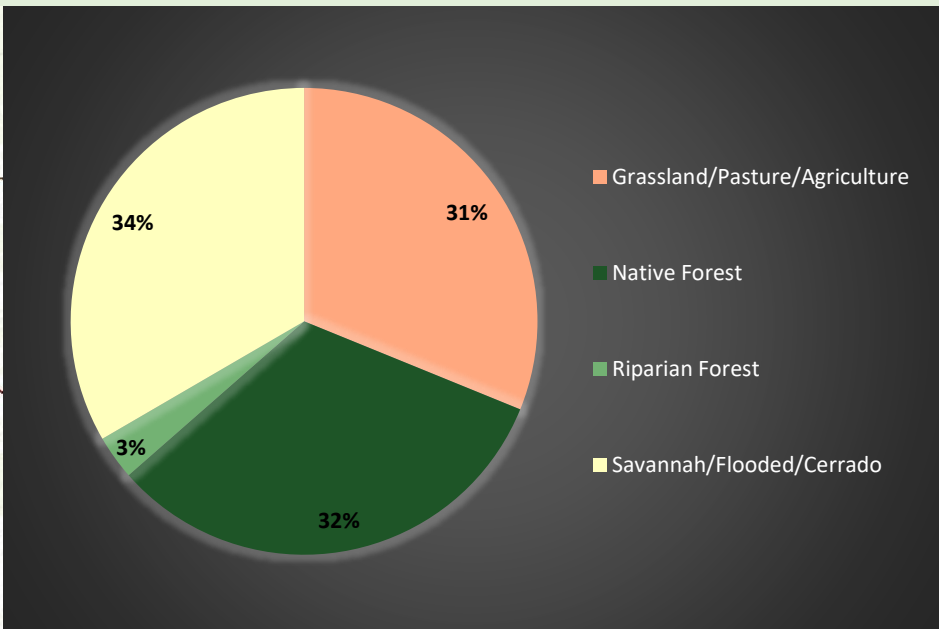
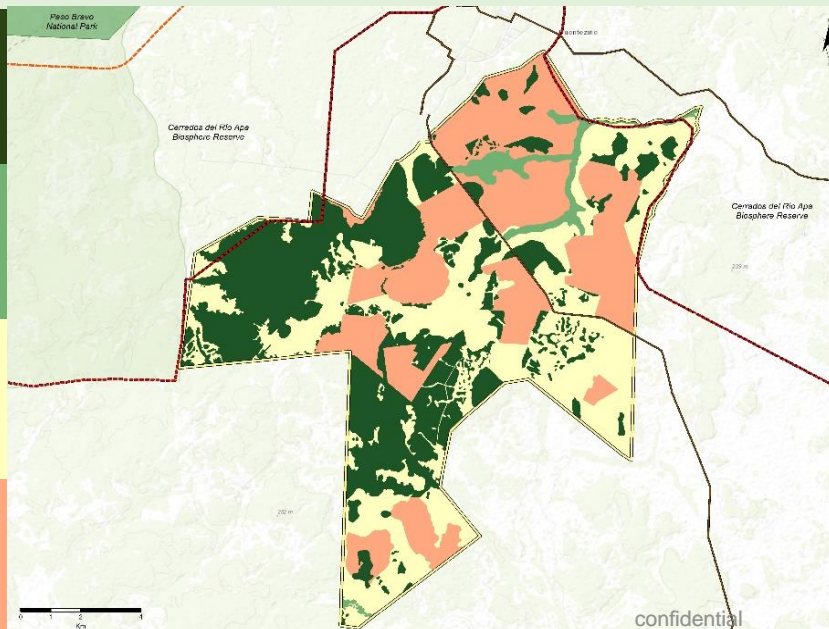
5.002

Savannah/Flooded/Cerrado



4.667

Grassland/Pasture/Agriculture



confidential

556

Isla Alta

confidential

Total surface (ha)

Forestry-Environmental Analysis

FOREST MANAGEMENT

86%

478

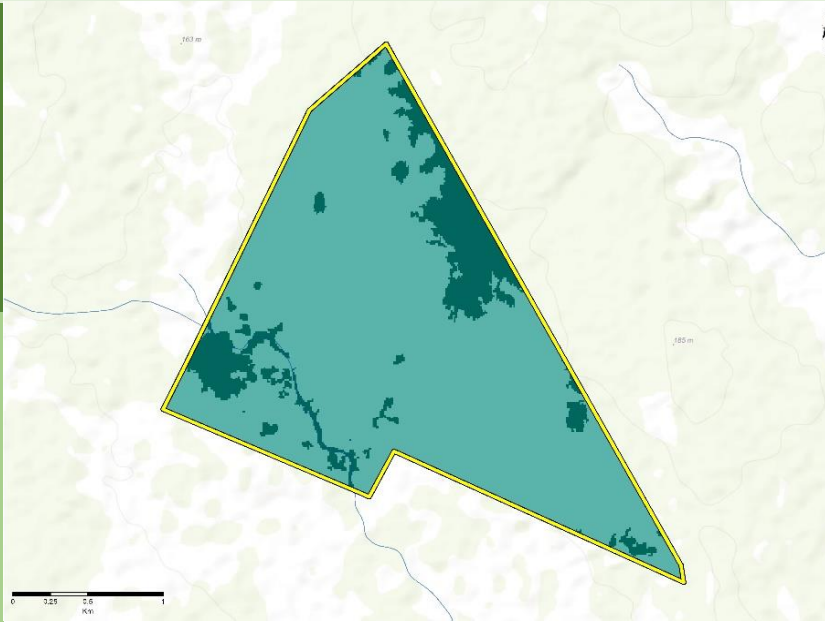
Plantable area



14%

78

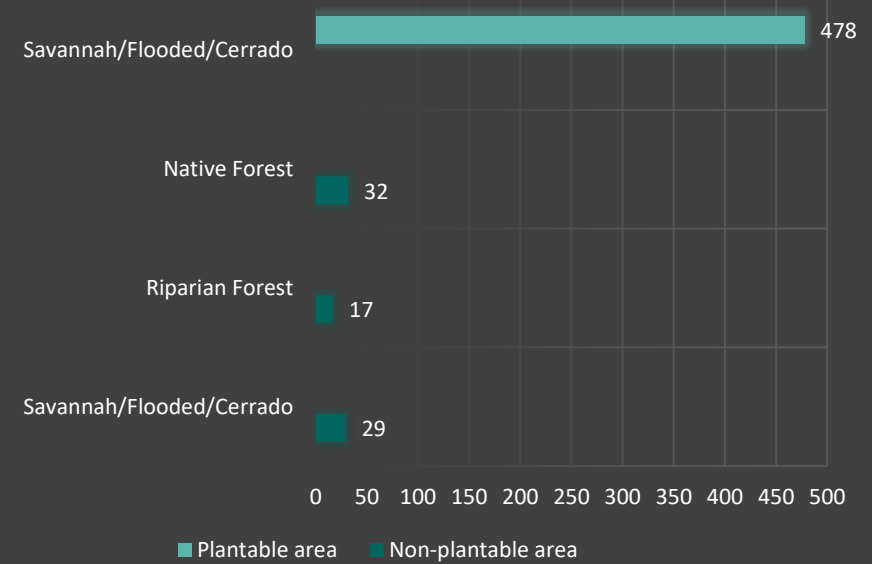
Conservation area



Plantable area

Isla Alta

Conservation area



LAND USE AND LAND COVER

32

Native Forest



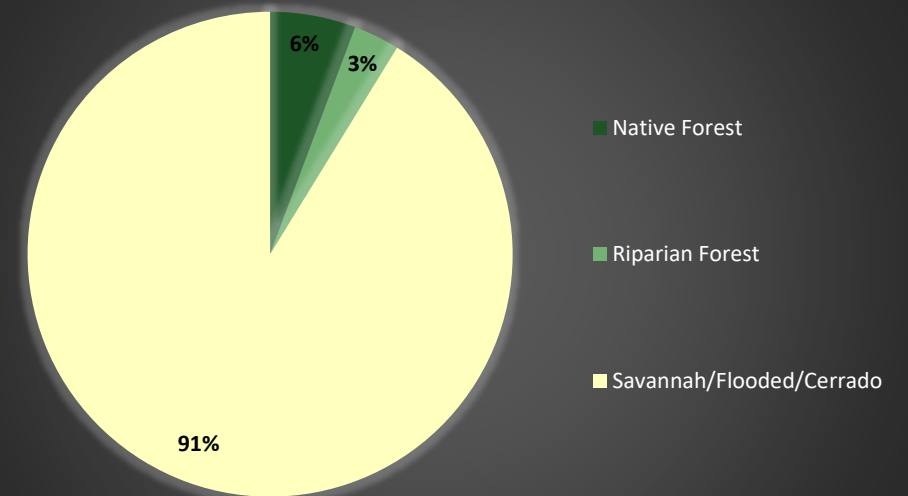
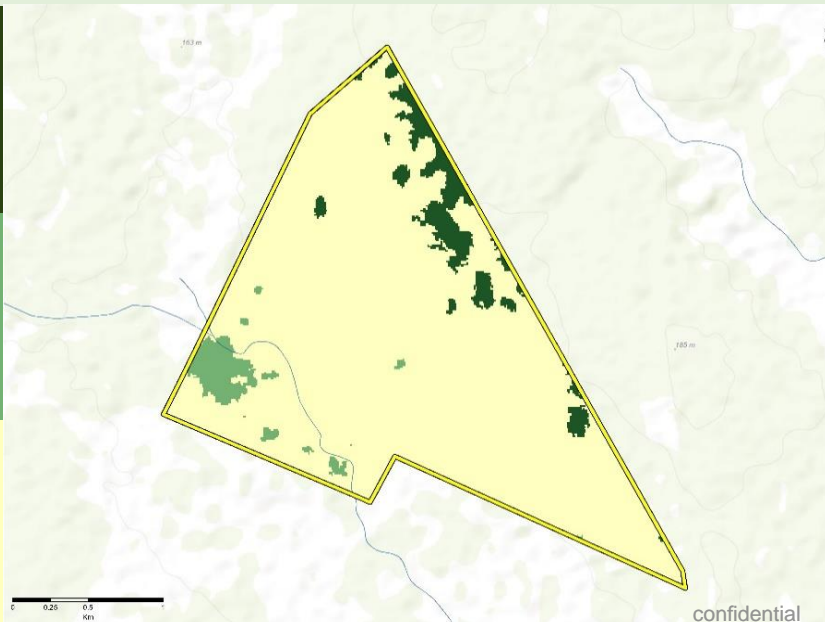
17

Riparian Forest



507

Savannah/Flooded/Cerrado



confidential

5.632

La Blanca

confidential

Total surface (ha)

Forestry-Environmental Analysis

FOREST MANAGEMENT

53%

2.975

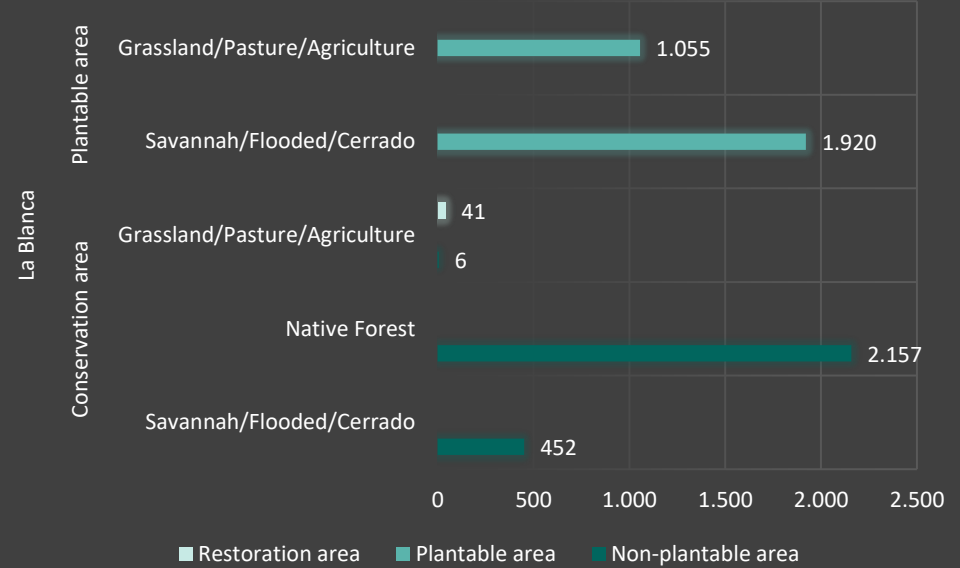
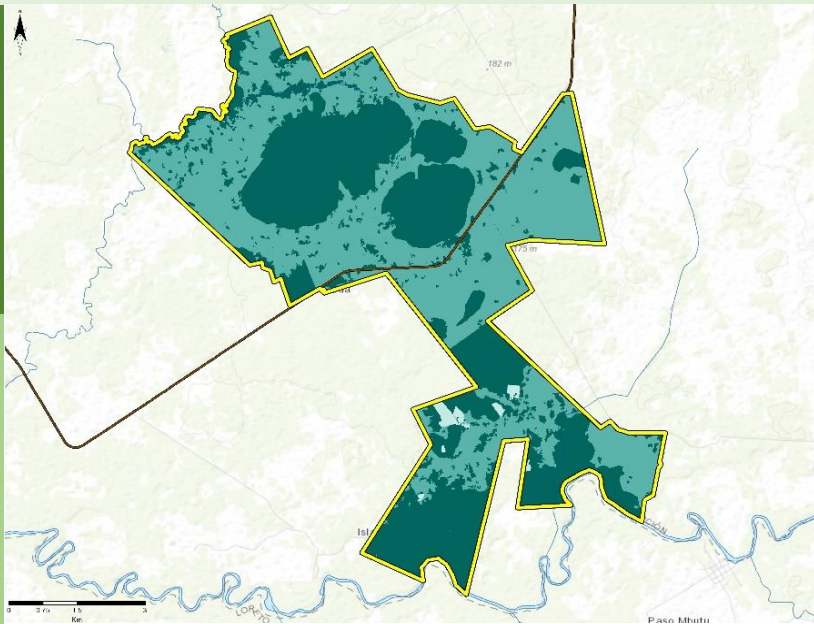
Plantable area



47%

2.656

Conservation area



LAND USE AND LAND COVER

2.157

Native Forest



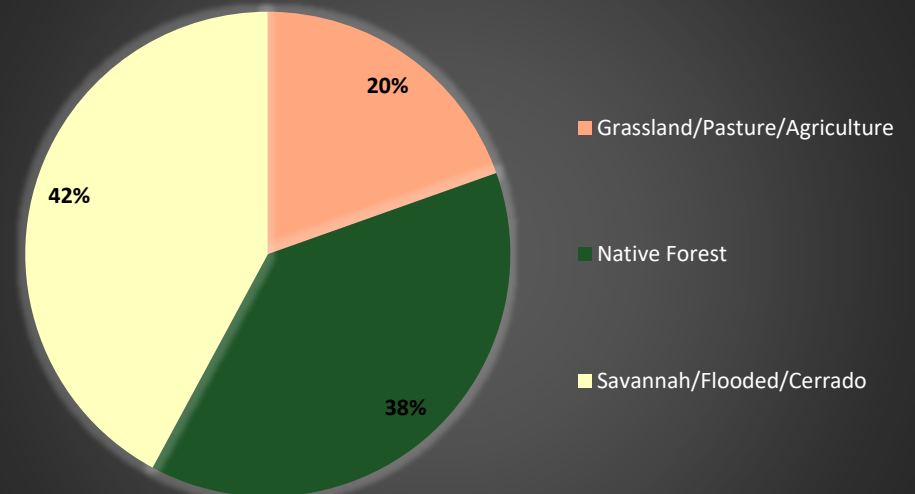
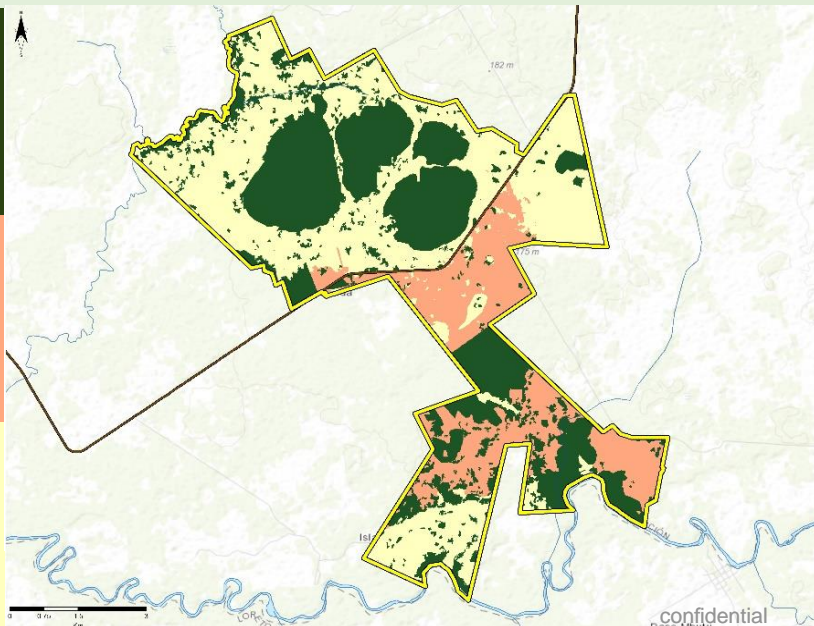
1.102

Grassland/Pasture/Agriculture



2.372

Savannah/Flooded/Cerrado



4.221

La Paraguaya

confidential



Total surface (ha)

Forestry-Environmental Analysis

FOREST MANAGEMENT

30%

1.251

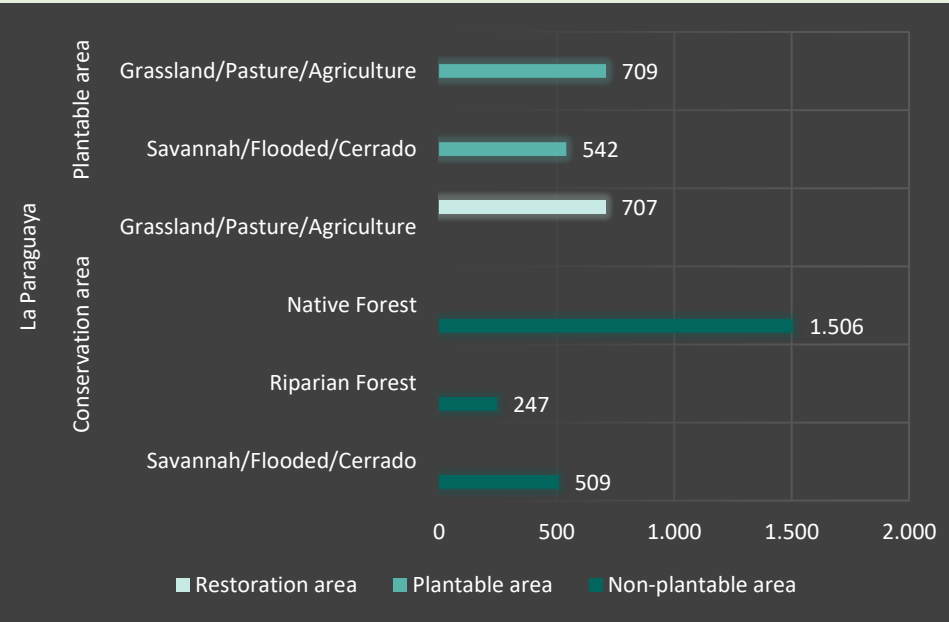
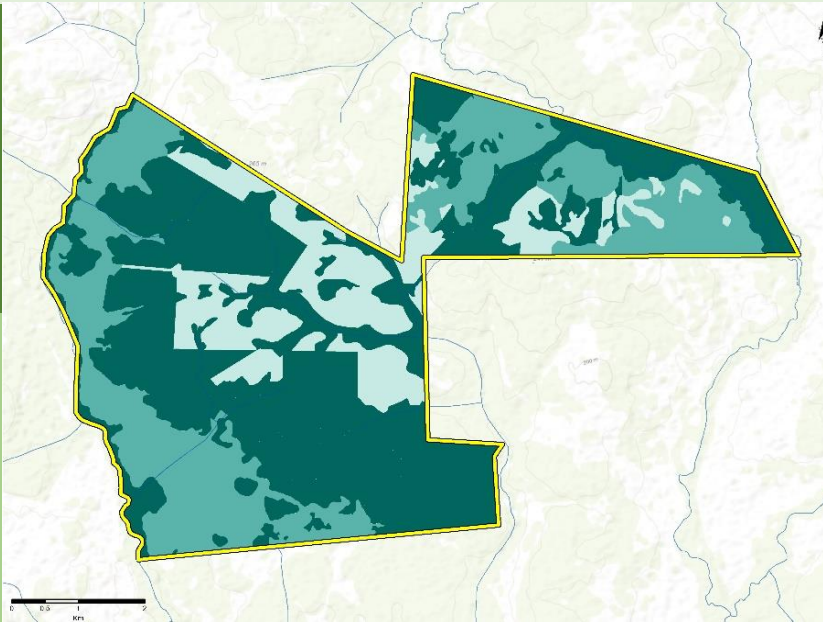
Plantable area



70%

2.969

Conservation area



LAND USE AND LAND COVER



1.506

Native Forest



247

Riparian Forest



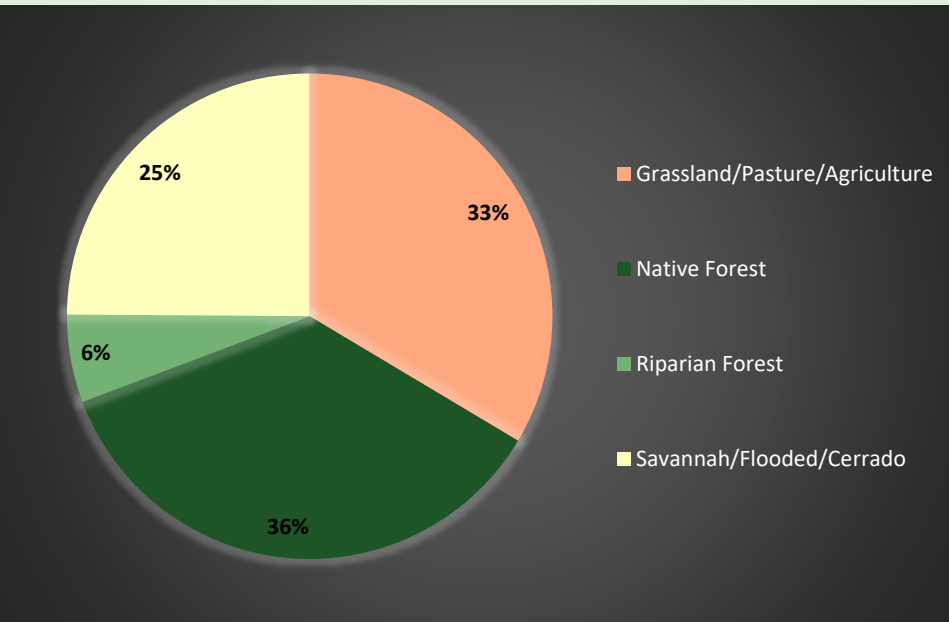
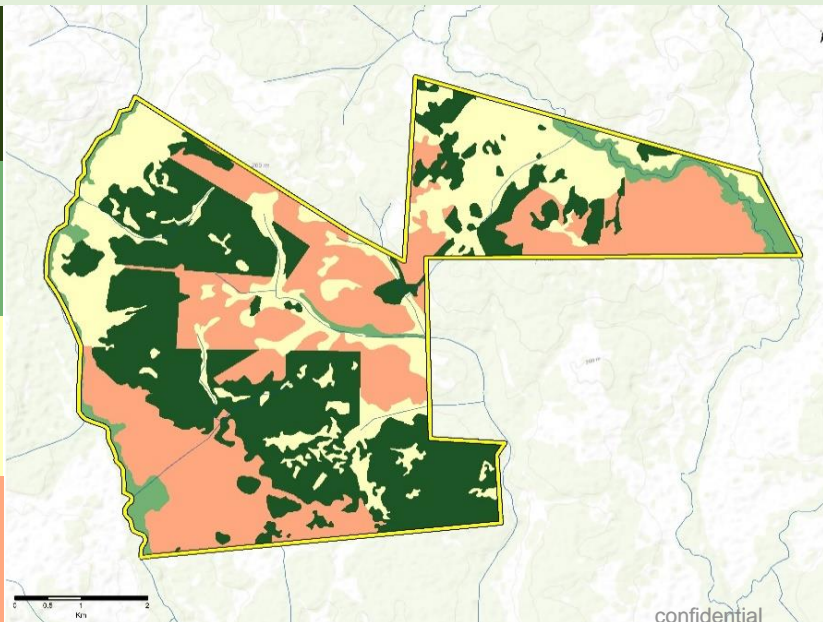
1.051

Savannah/Flooded/Cerrado



1.417

Grassland/Pasture/Agriculture



confidential

1.720

Machuca Cué

confidential

Total surface (ha)

Forestry-Environmental Analysis

FOREST MANAGEMENT

40%

685

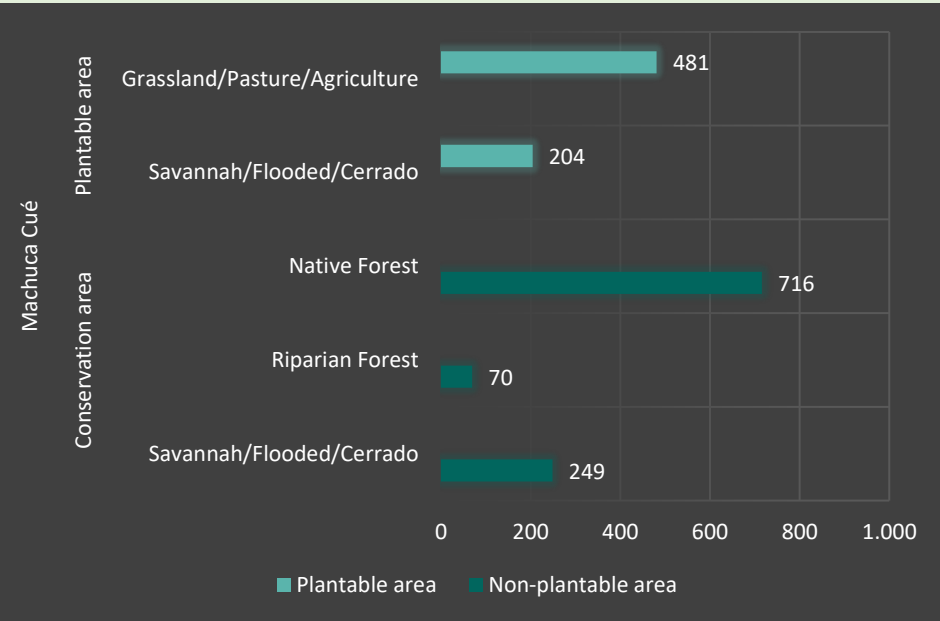
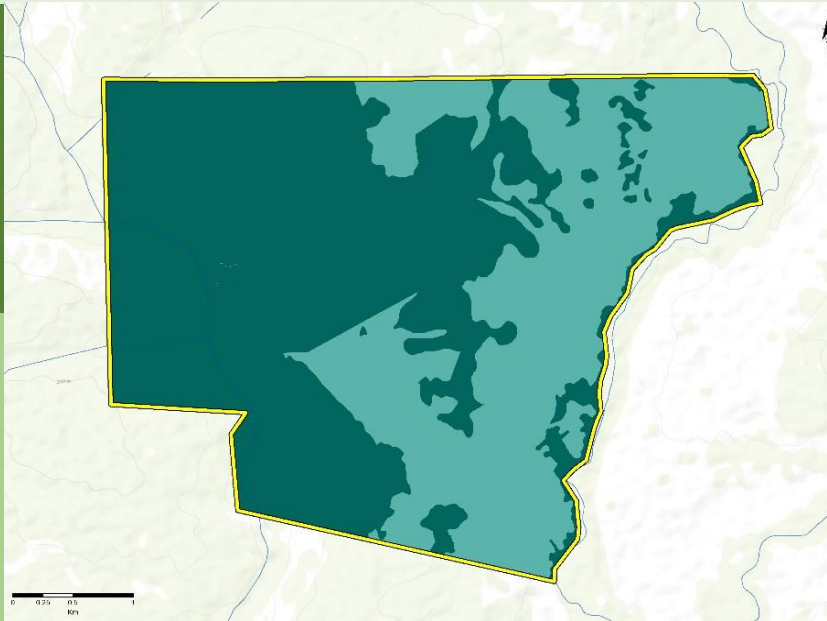
Plantable area



60%

1.034

Conservation area



LAND USE AND LAND COVER



716

Native Forest



70

Riparian Forest



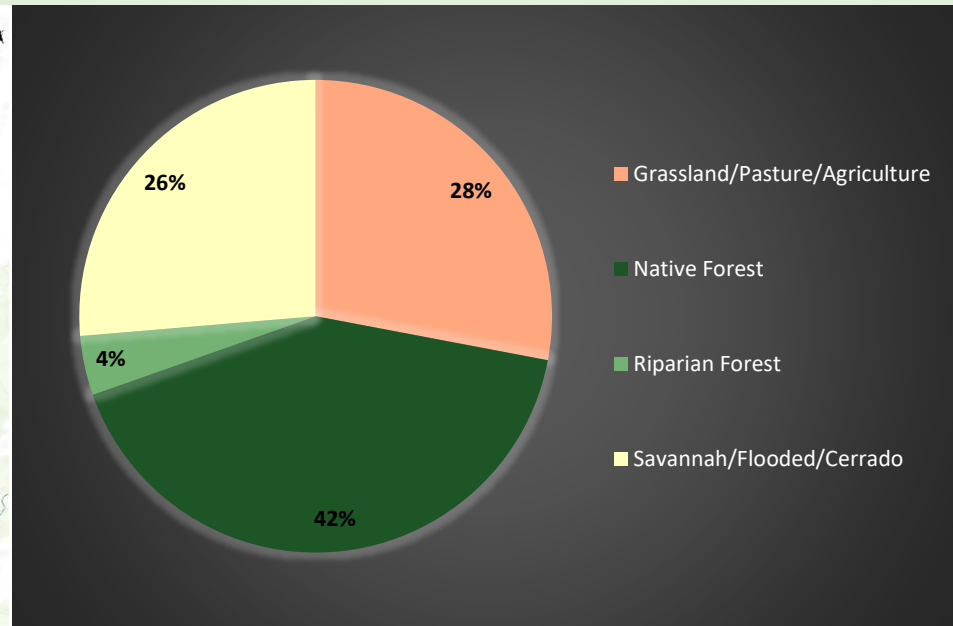
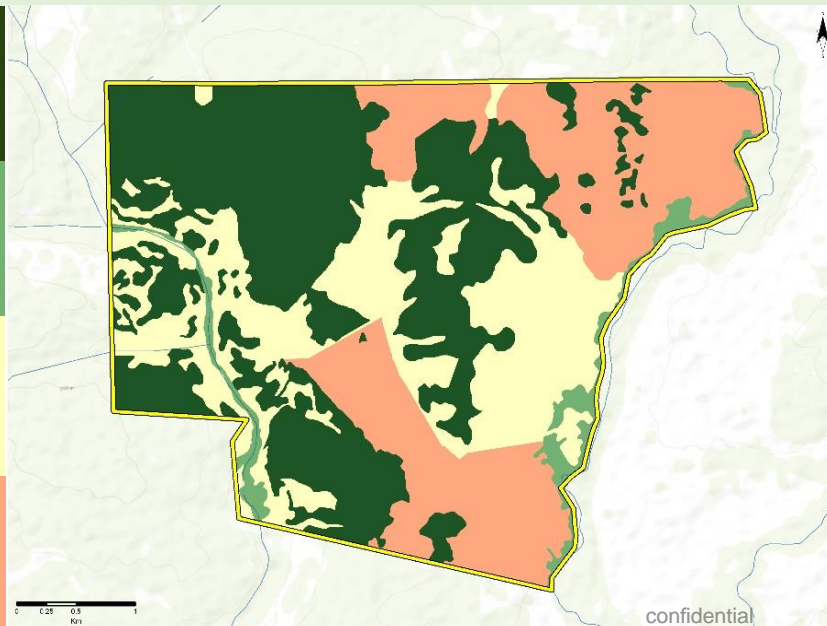
453

Savannah/Flooded/Cerrado



481

Grassland/Pasture/Agriculture



confidential

4.074

Mandijú

confidential

Total surface (ha)

Forestry-Environmental Analysis

FOREST MANAGEMENT

66%

2.692

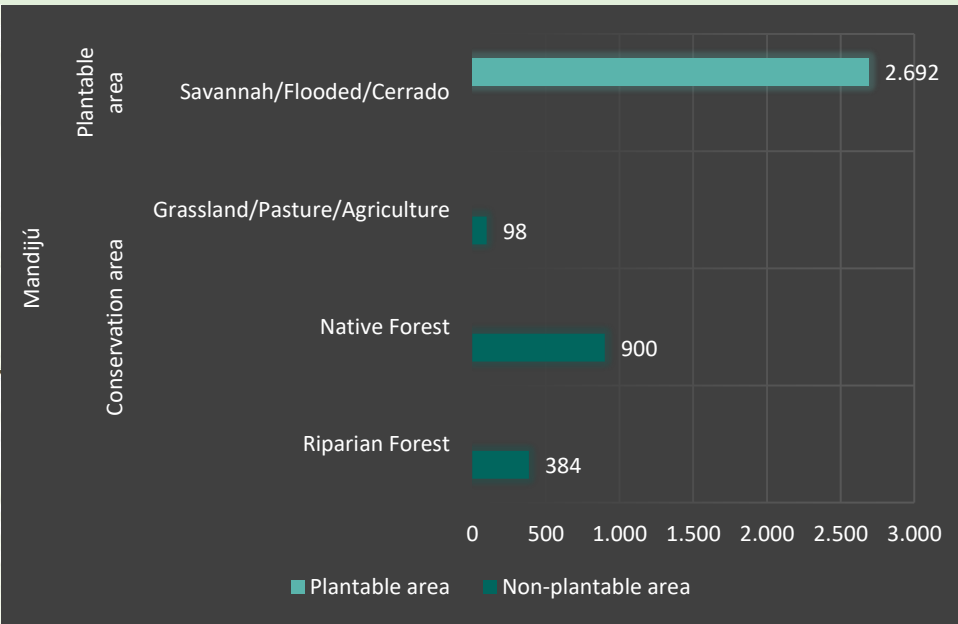
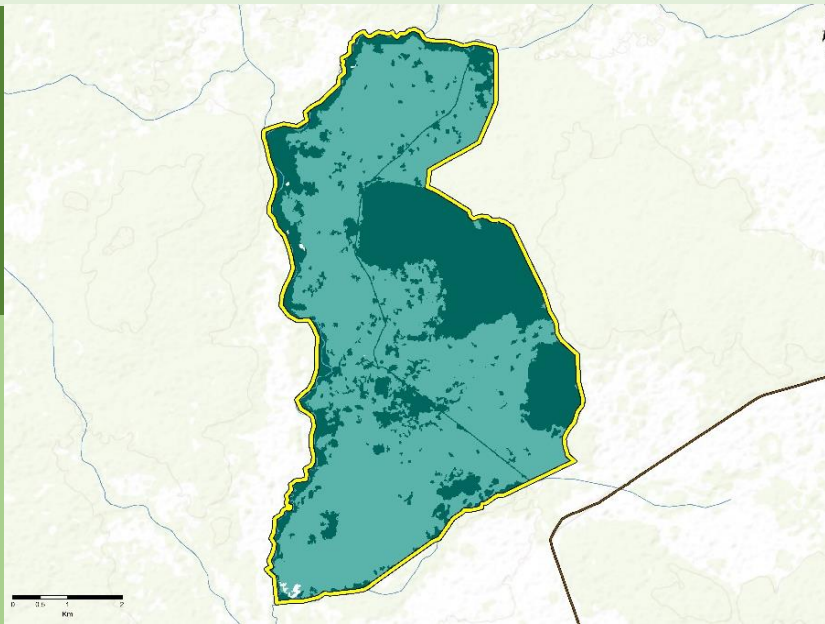
Plantable area



34%

1.382

Conservation area



LAND USE AND LAND COVER



900

Native Forest



384

Riparian Forest



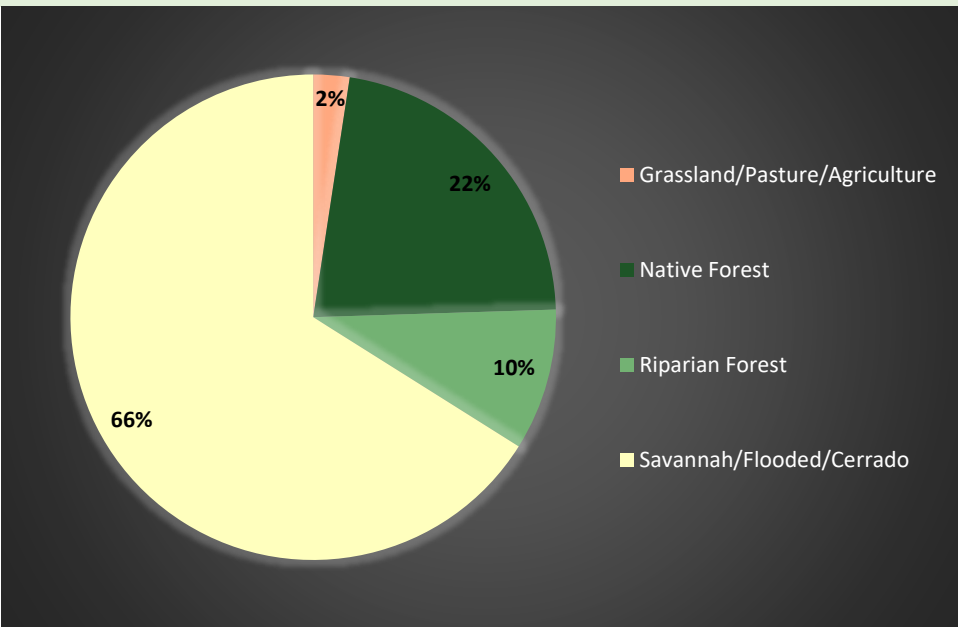
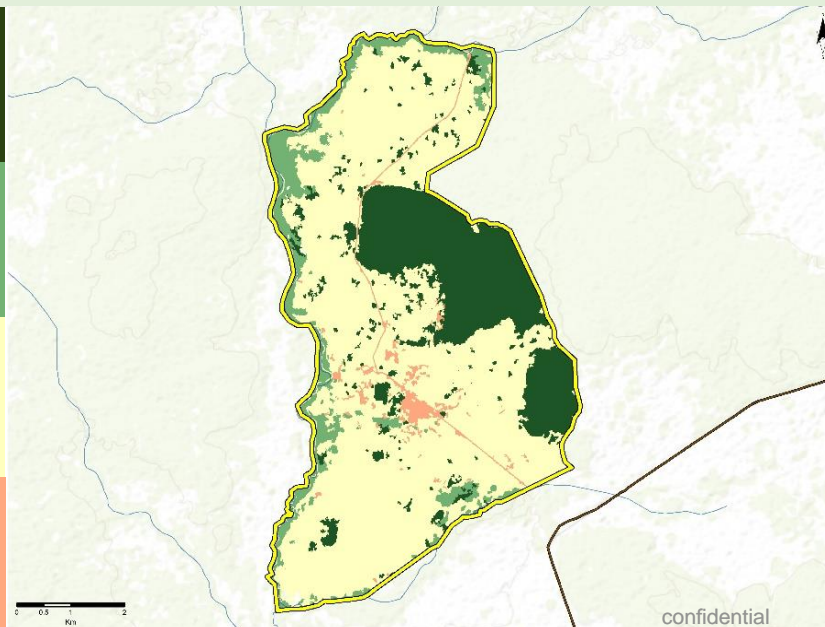
2.692

Savannah/Flooded/Cerrado



98

Grassland/Pasture/Agriculture



confidential

19.345

Rancho Z

confidential

Total surface (ha)

FOREST MANAGEMENT

74%

14.373

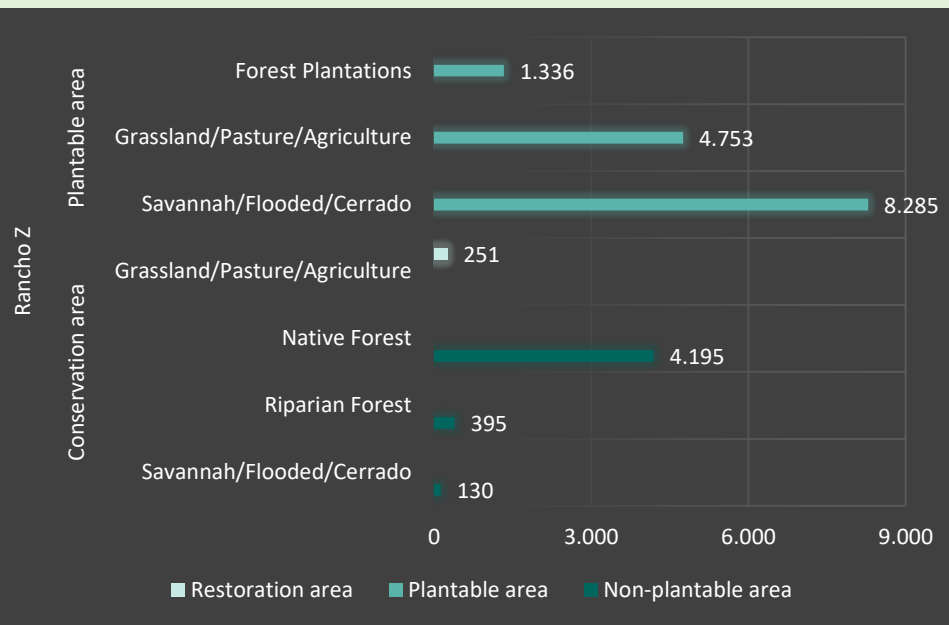
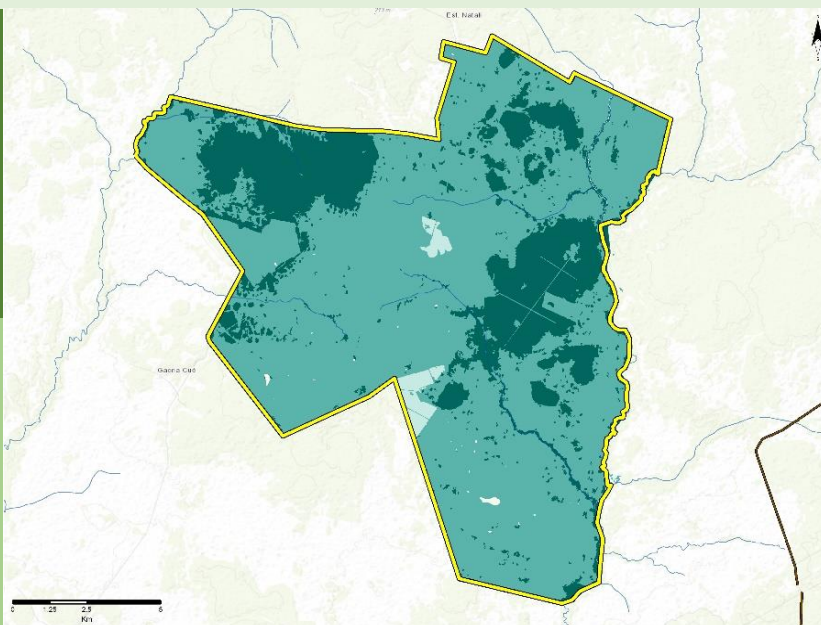
Plantable area



26%

4.972

Conservation area



LAND USE AND LAND COVER



4.195

Native Forest



395

Riparian Forest



8.415

Savannah/Flooded/Cerrado



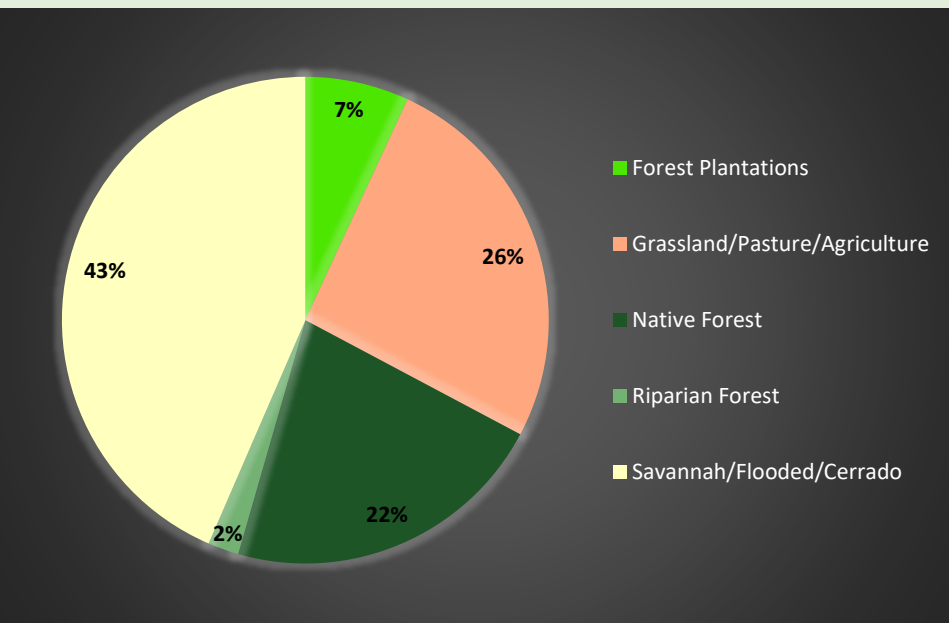
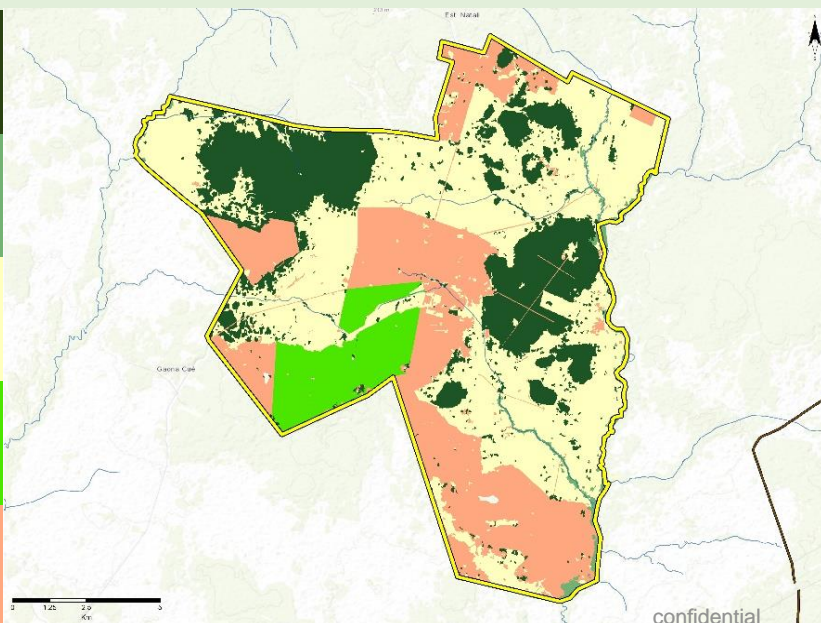
1.336

Forest Plantations



5.004

Grassland/Pasture/Agriculture



confidential

706

Ronaldo

confidential

Total surface (ha)

Forestry-Environmental Analysis

FOREST MANAGEMENT

3%

21

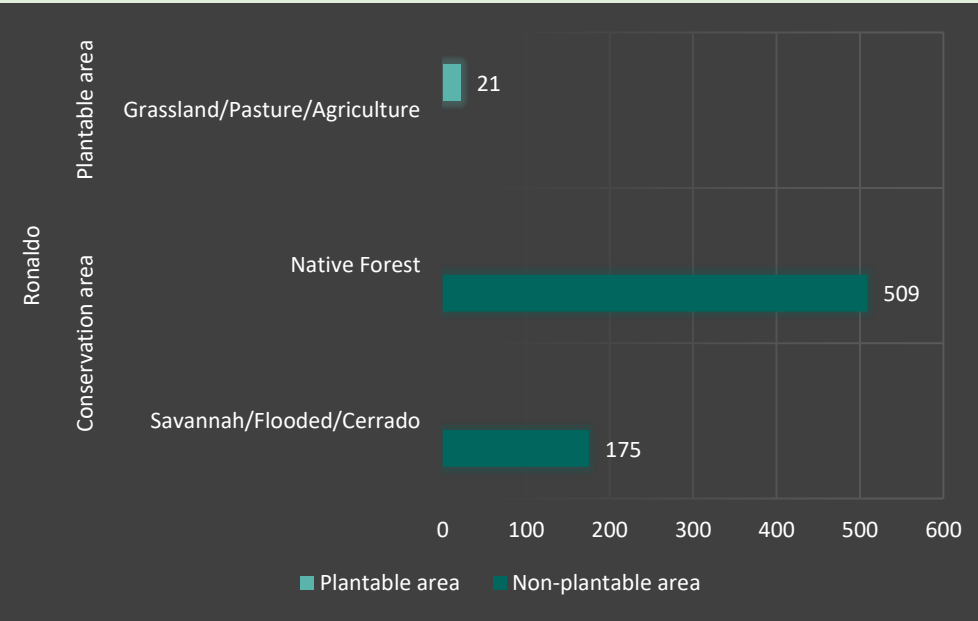
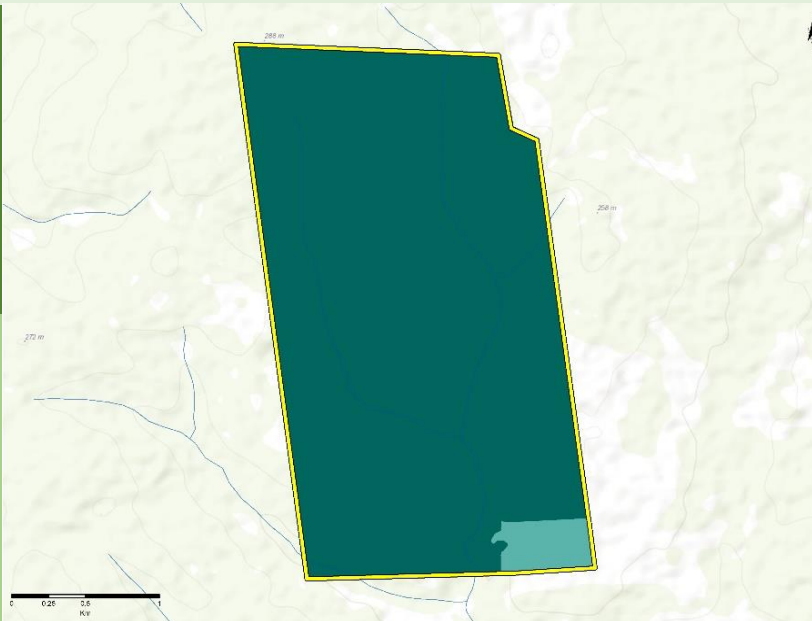
Plantable area



97%

684

Conservation area



LAND USE AND LAND COVER

509

Native Forest



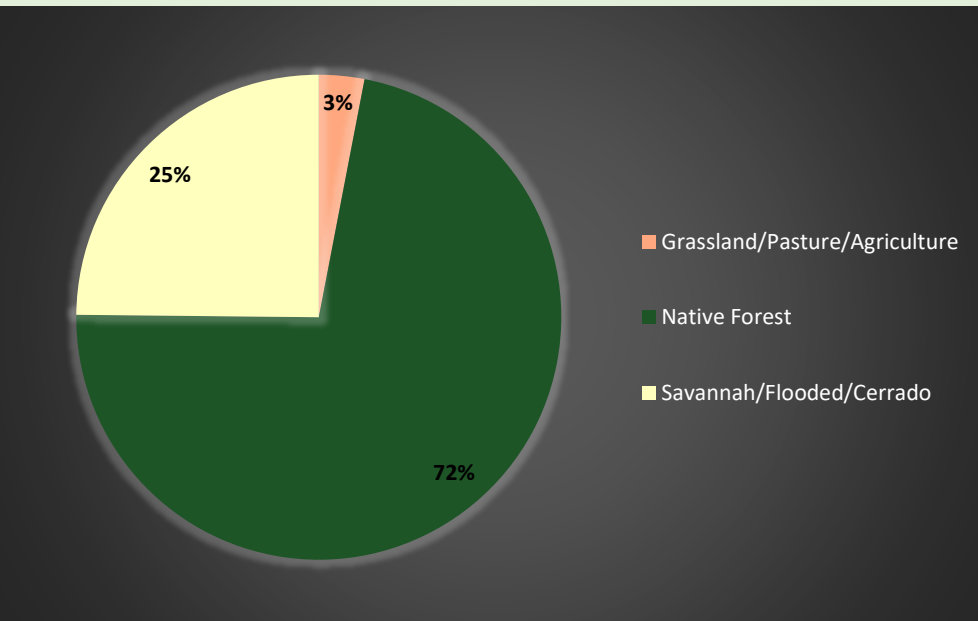
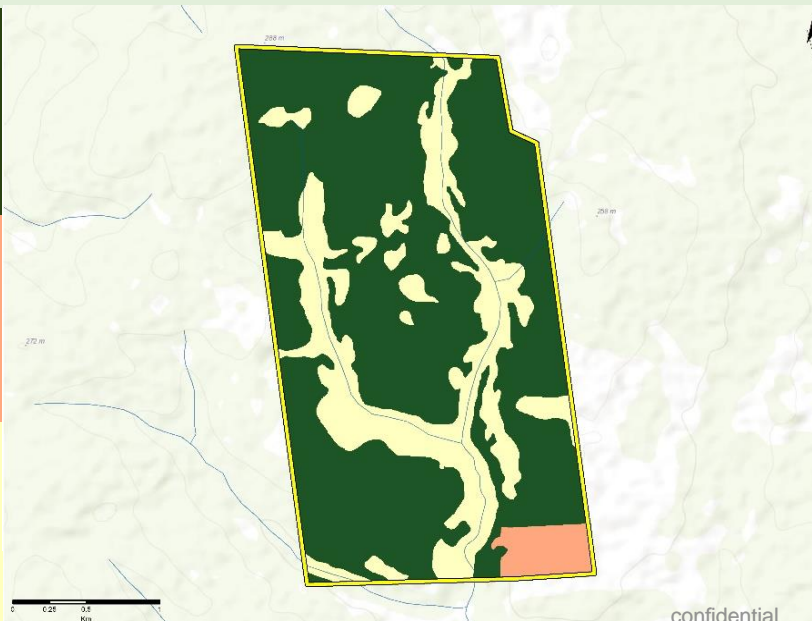
21

Grassland/Pasture/Agriculture



175

Savannah/Flooded/Cerrado



confidential

18.502

San Liberato

confidential

Total surface (ha)

Forestry-Environmental Analysis

FOREST MANAGEMENT

68%

12.519

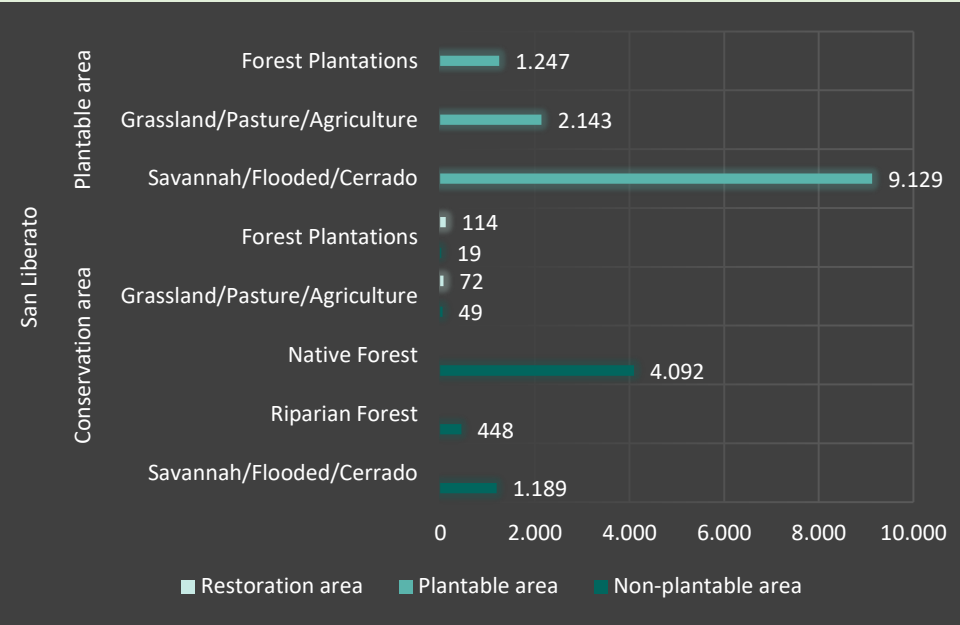
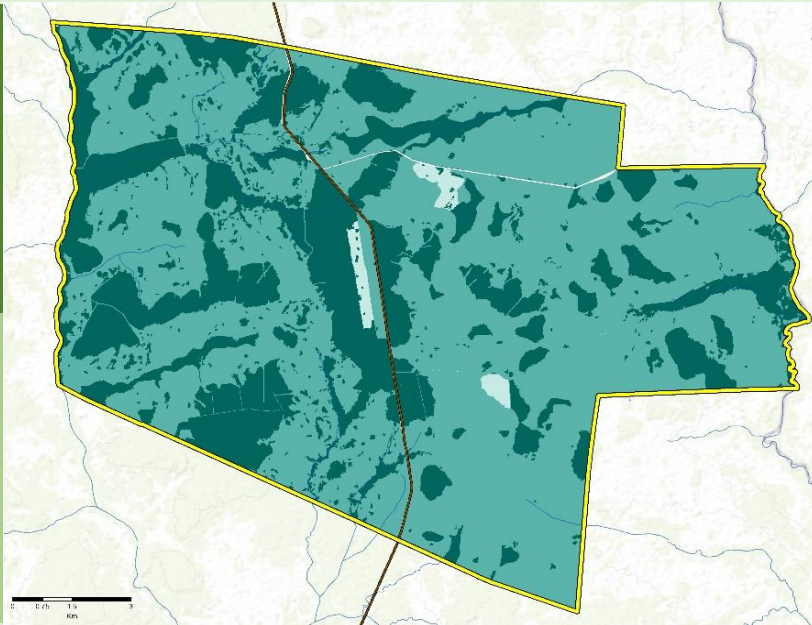
Plantable area



32%

5.983

Conservation area



LAND USE AND LAND COVER



4.092

Native Forest



448

Riparian Forest



10.318

Savannah/Flooded/Cerrado



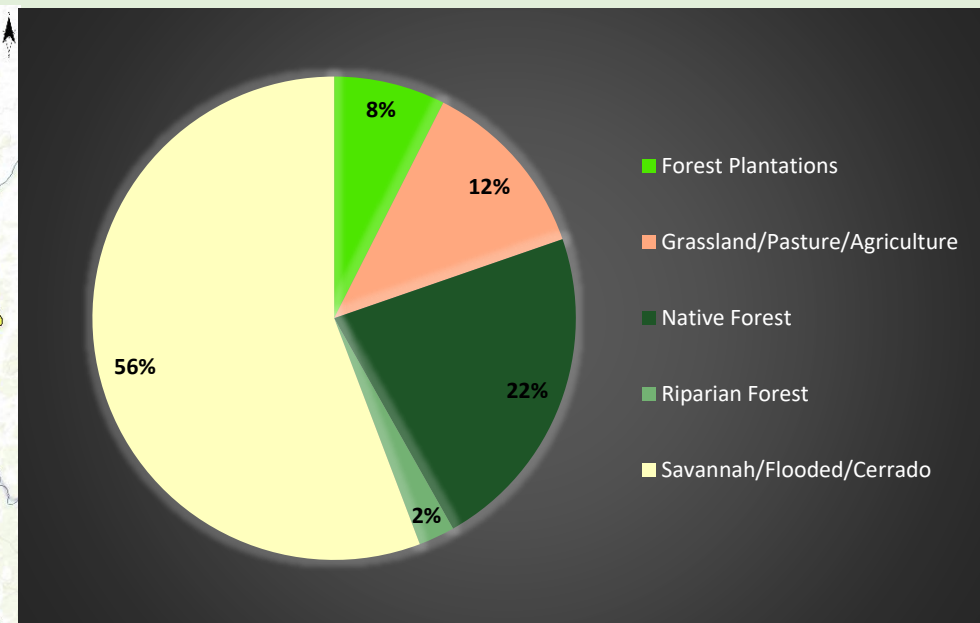
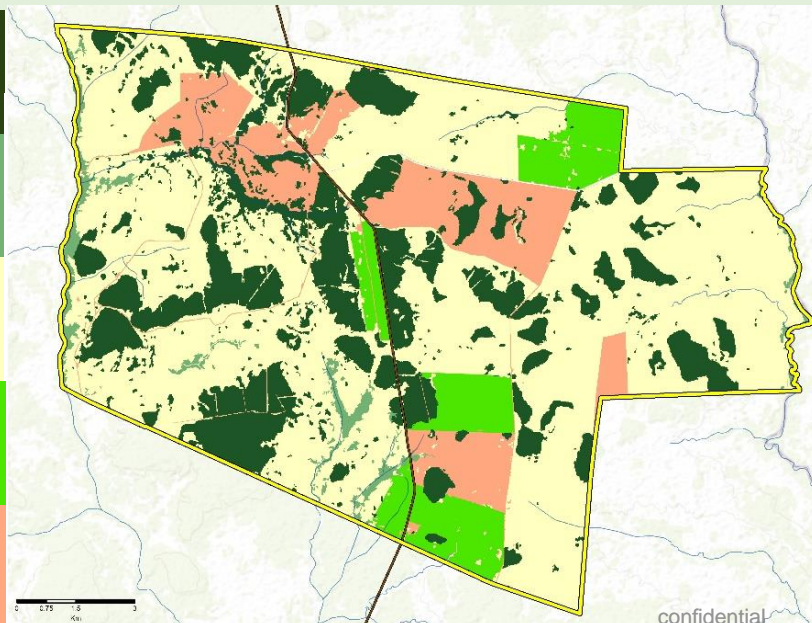
1.381

Forest Plantations



2.264

Grassland/Pasture/Agriculture



confidential

31.453

Santa Teresa

confidential



Total surface (ha)

Forestry-Environmental Analysis

FOREST MANAGEMENT

61%

19.245

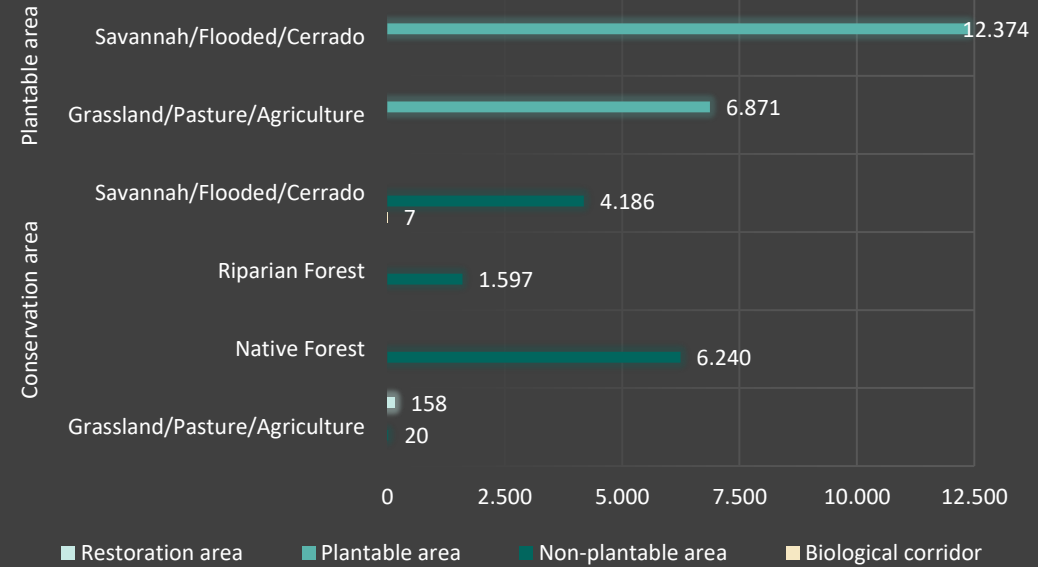
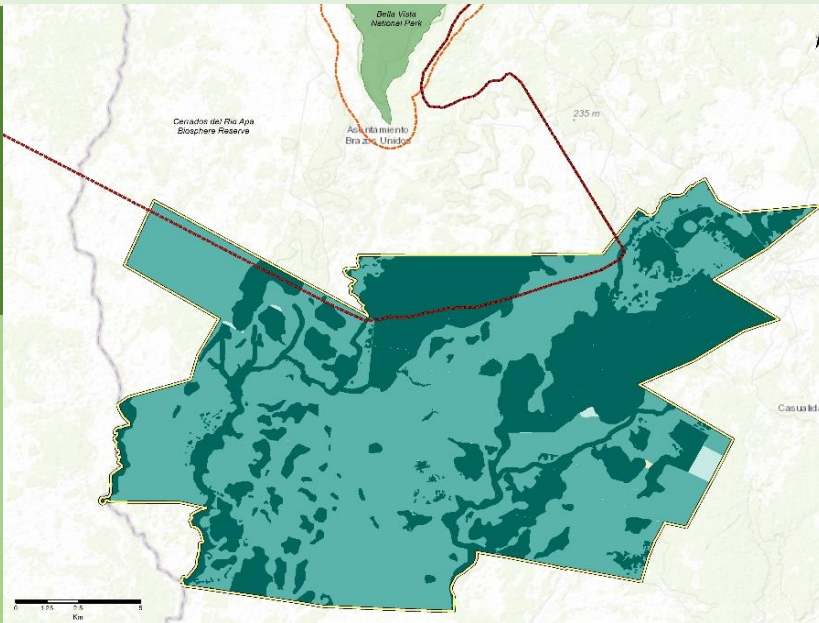
Plantable area



39%

12.208

Conservation area



LAND USE AND LAND COVER



6.240

Native Forest



1.597

Riparian Forest



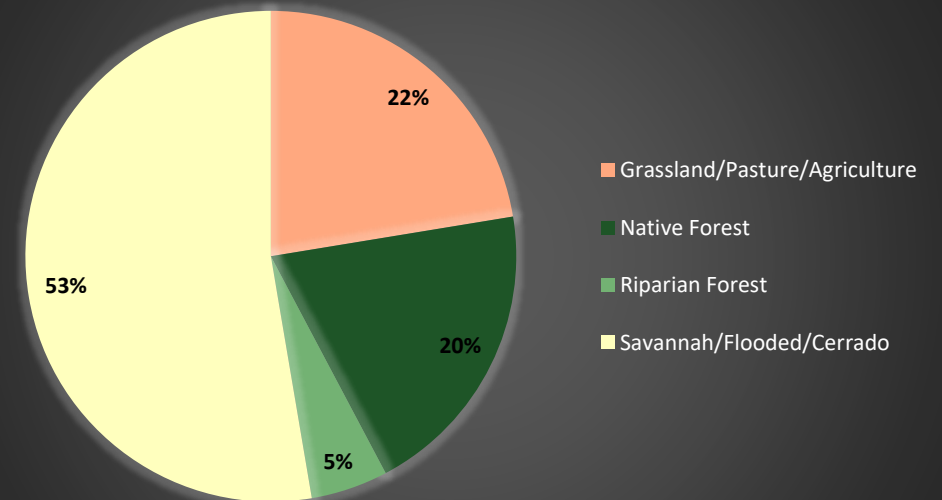
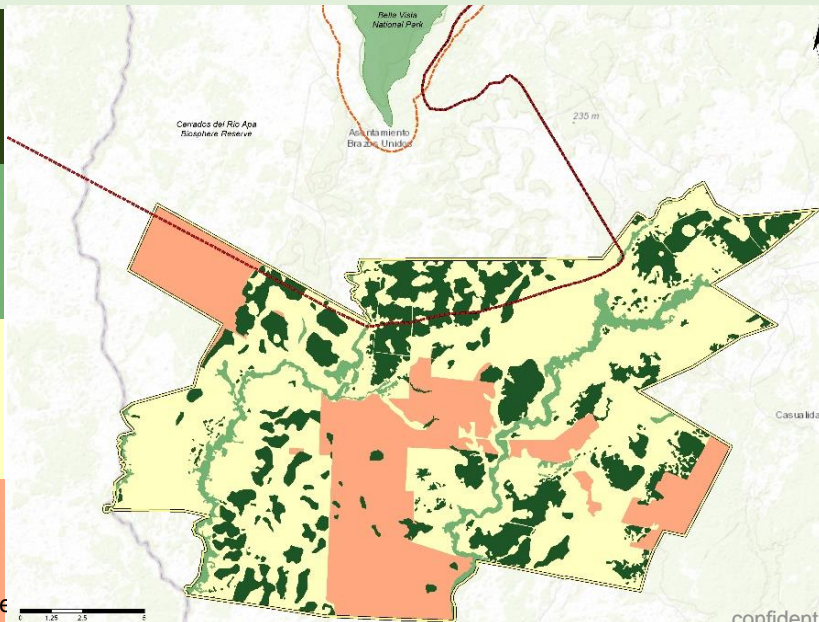
16.567

Savannah/Flooded/Cerrado



7.049

Grassland/Pasture/Agriculture



confidential

1.149

Silva

confidential

Total surface (ha)

Forestry-Environmental Analysis

FOREST MANAGEMENT

86%

478

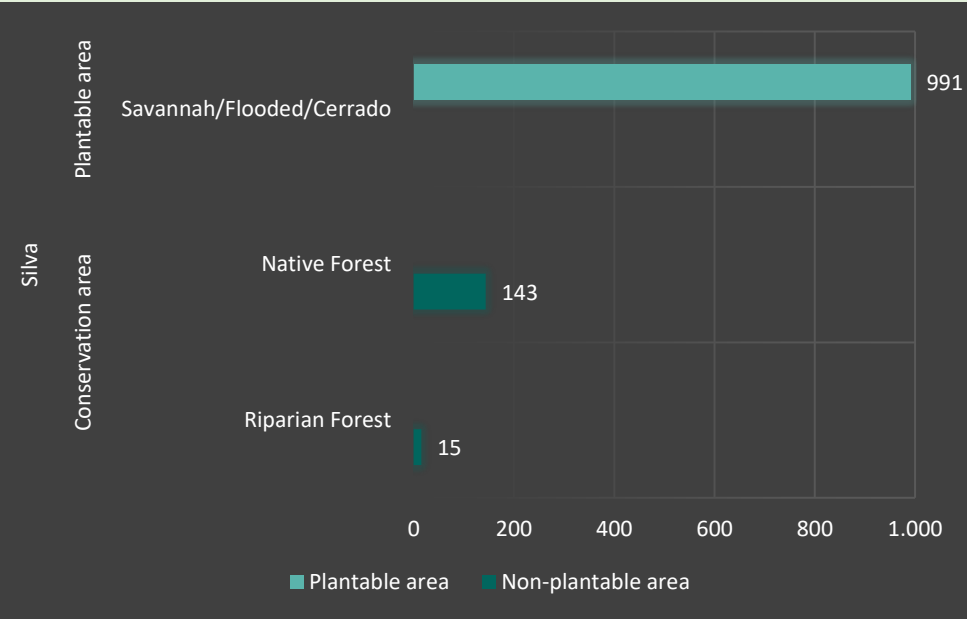
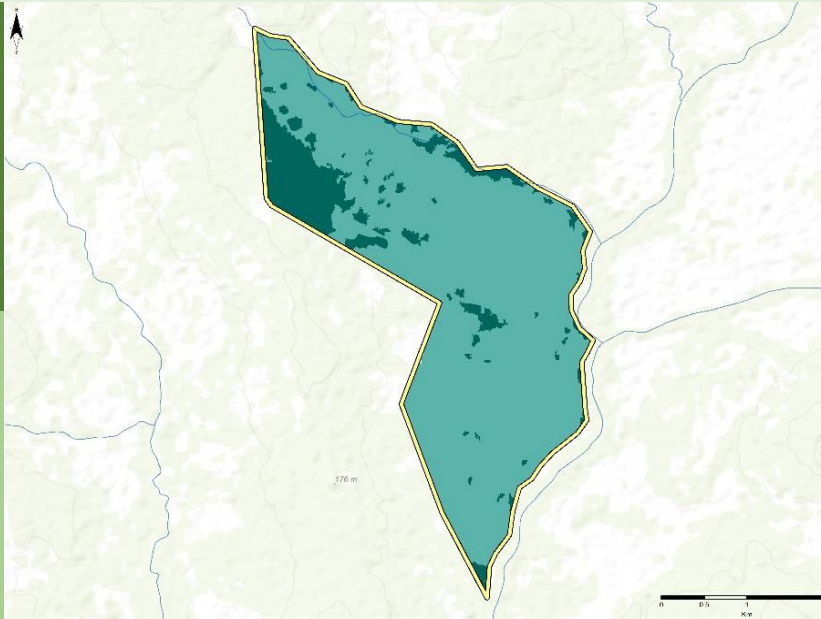
Plantable area



14%

78

Conservation area



LAND USE AND LAND COVER

143

Native Forest



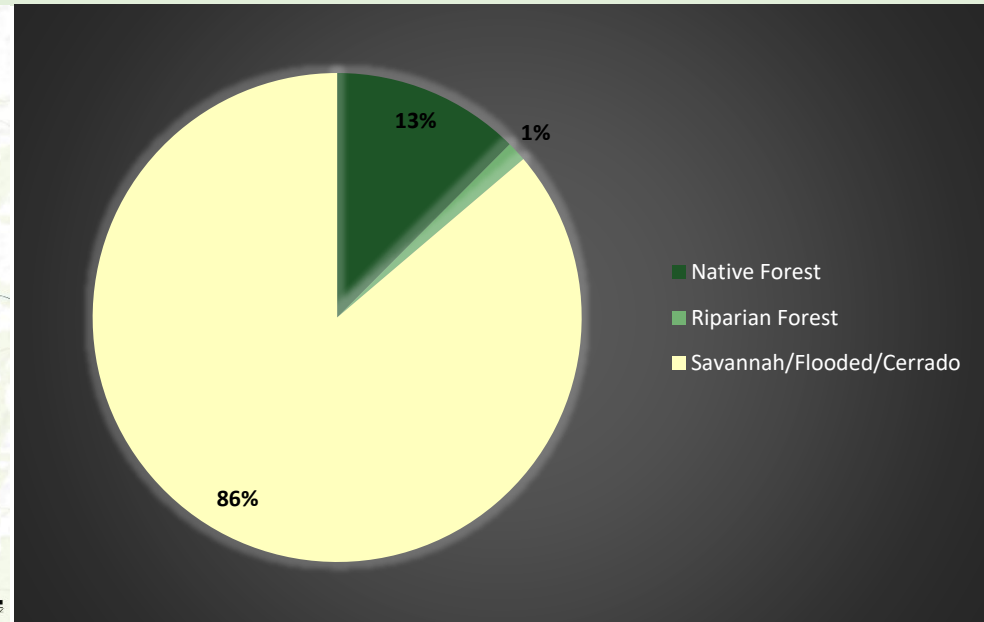
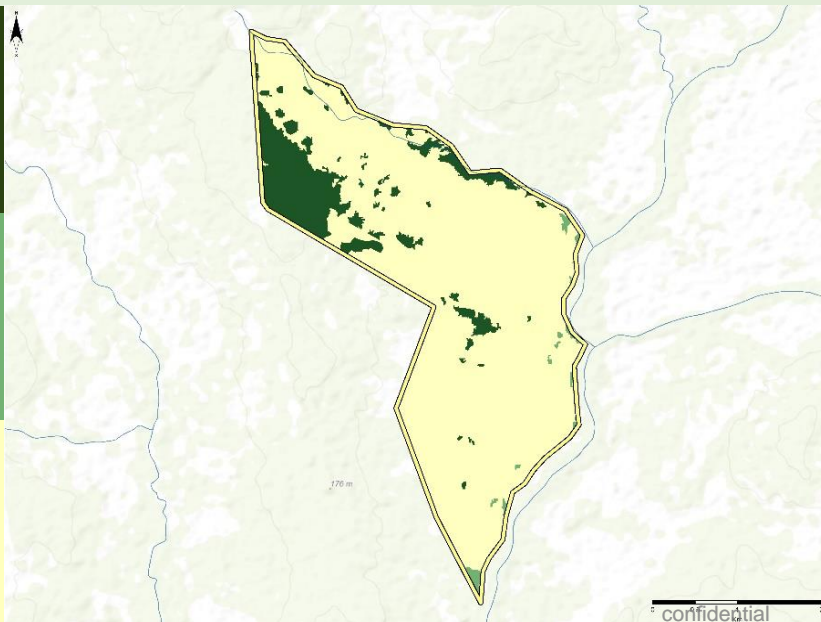
15

Riparian Forest



991

Savannah/Flooded/Cerrado



confidential

10.120

Soledad

Total surface (ha)

FOREST MANAGEMENT

5%

473

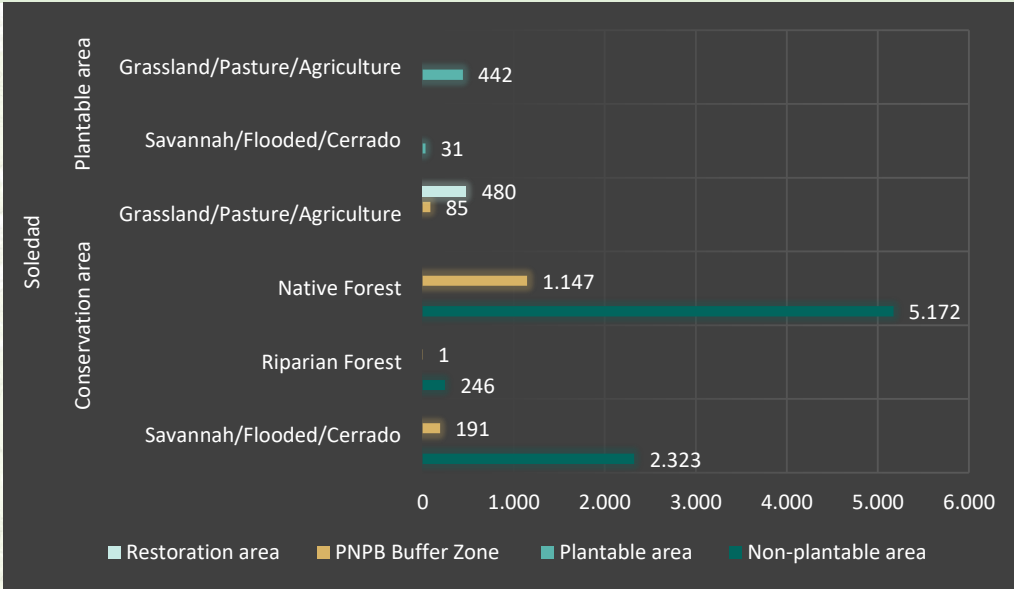
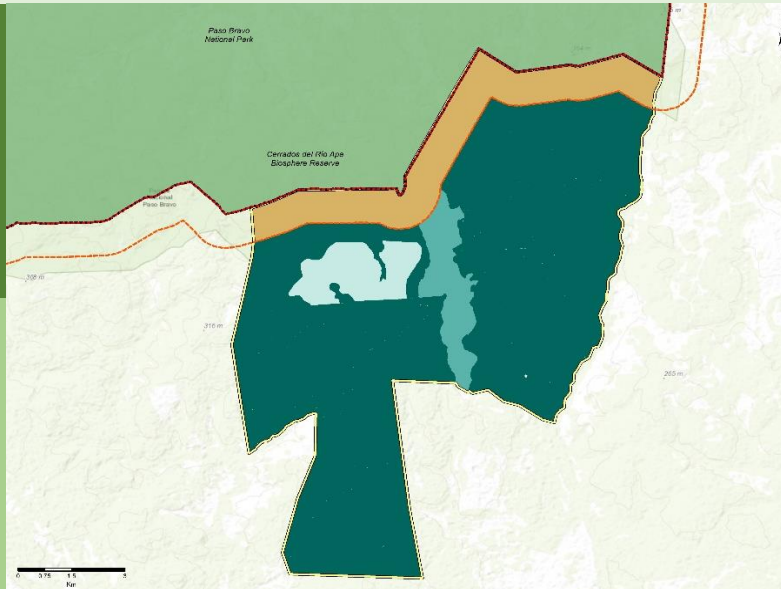
Plantable area



95%

9.647

Conservation area



LAND USE AND LAND COVER

6.319

Native Forest

247

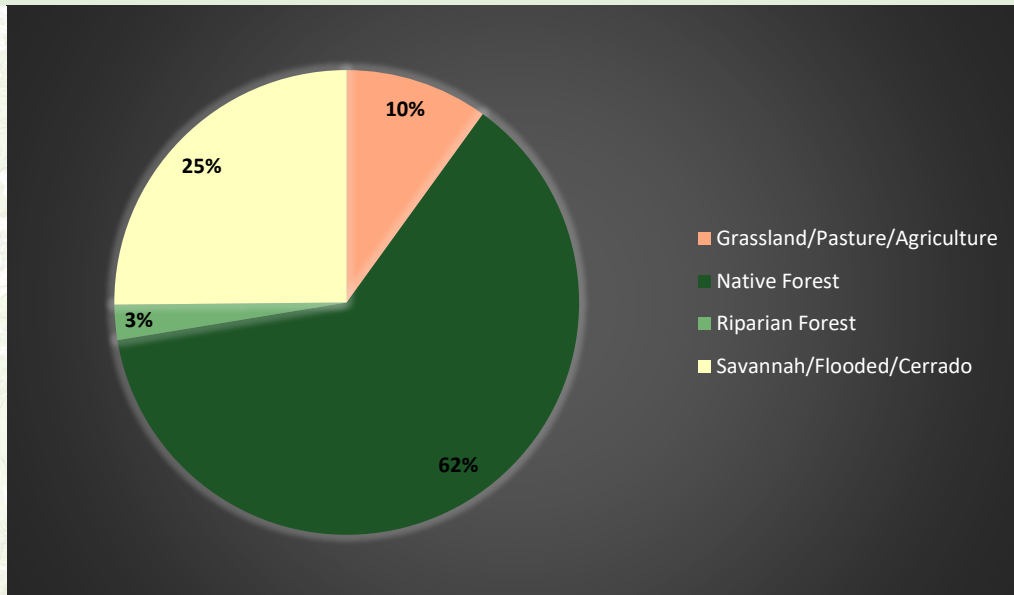
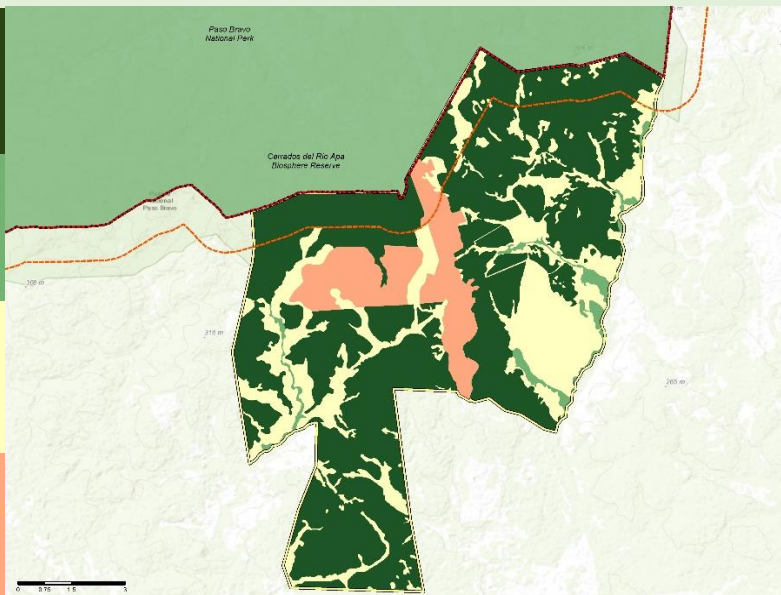
Riparian Forest

2.546

Savannah/Flooded/Cerrado

1.008

Grassland/Pasture/Agriculture



17.156

Trementina

confidential

Total surface (ha)

Forestry-Environmental Analysis

FOREST MANAGEMENT

72%

12.282

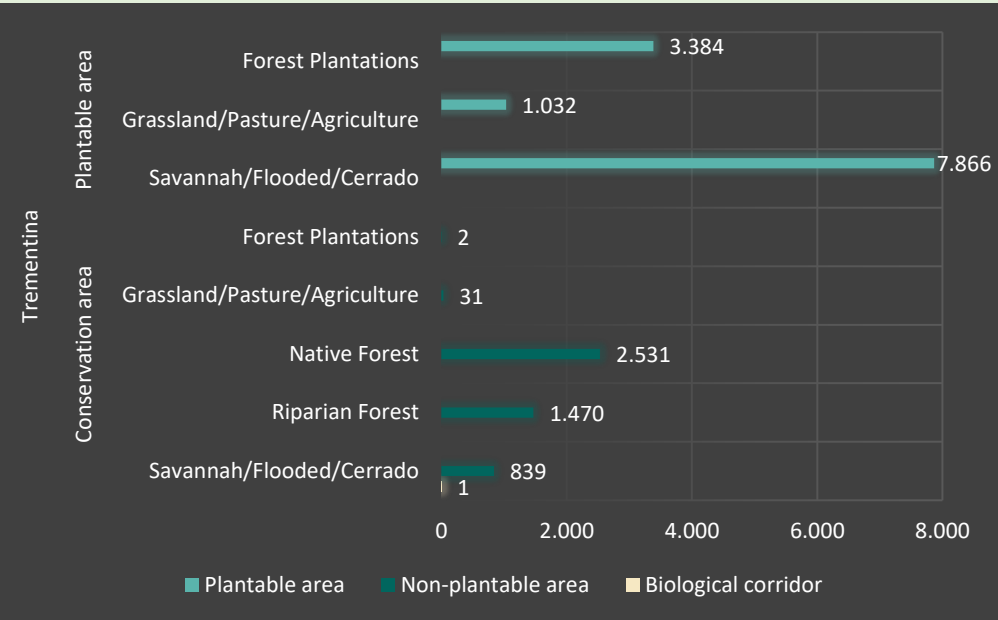
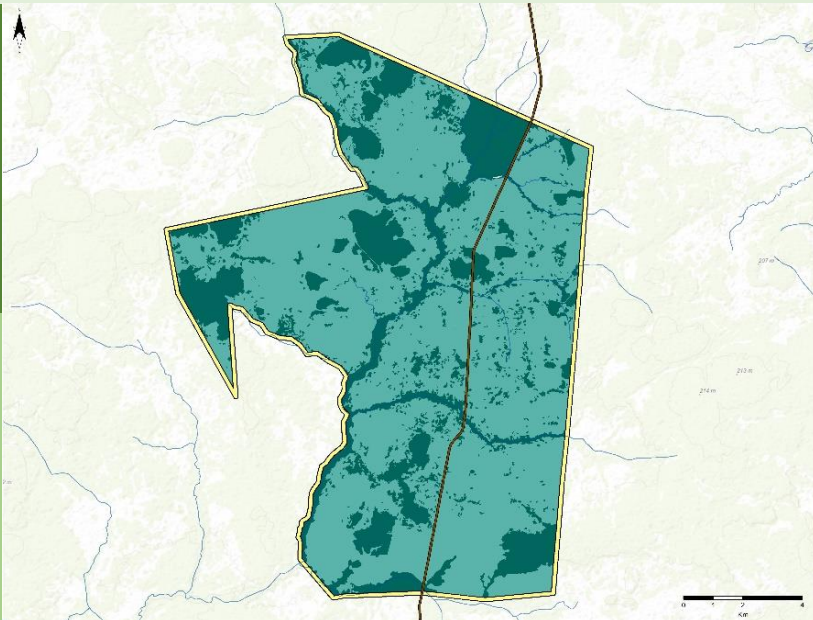
Plantable area



28%

4.874

Conservation area



LAND USE AND LAND COVER



2.531

Native Forest



1.470

Riparian Forest



8.706

Savannah/Flooded/Cerrado



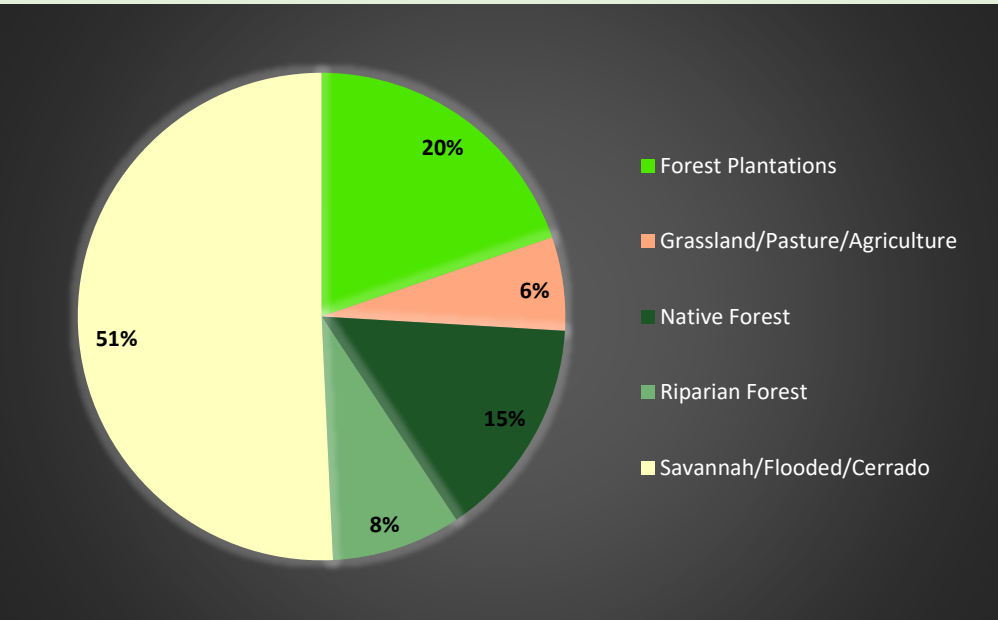
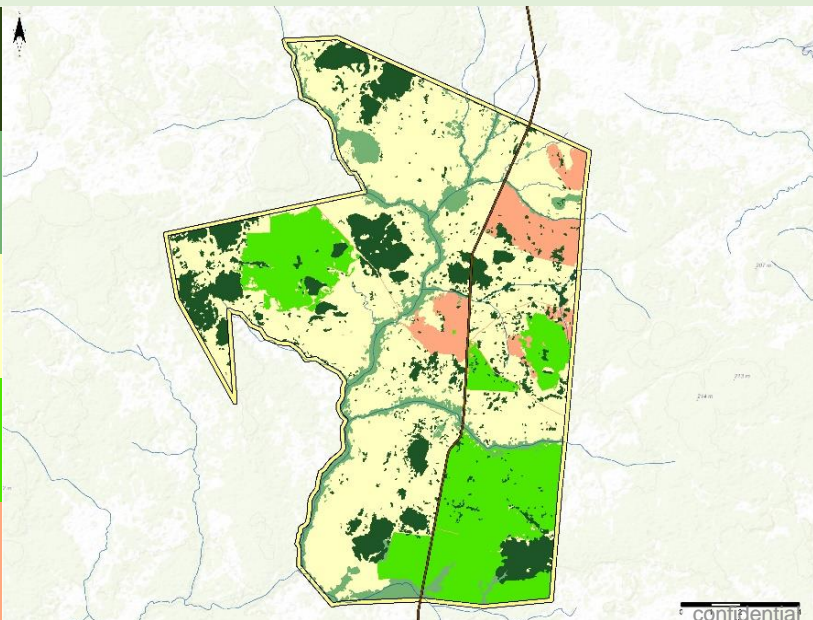
3.386

Forest Plantations



1.063

Grassland/Pasture/Agriculture



confidential

17.179

Villa Sana

Total surface (ha)

FOREST MANAGEMENT

44%

7.527

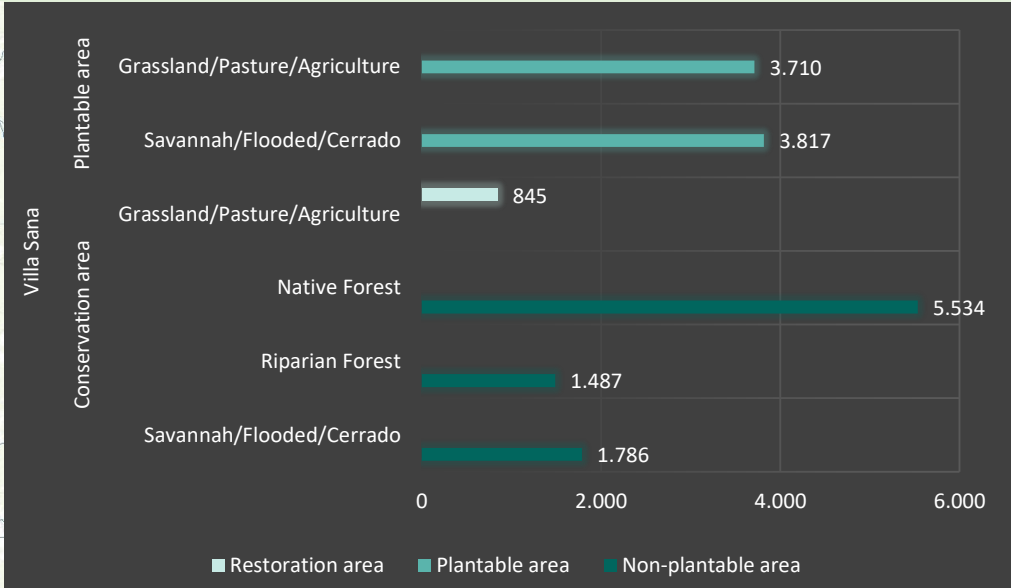
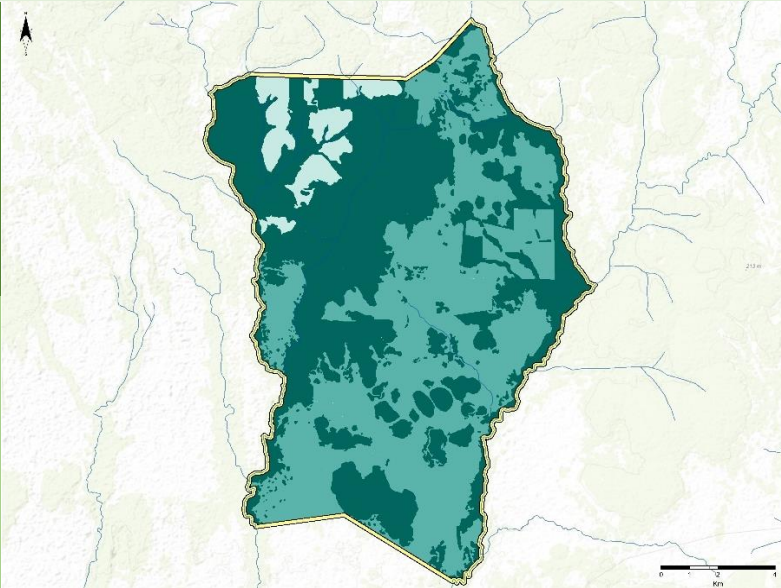
Plantable area



56%

9.651

Conservation area



LAND USE AND LAND COVER



5.534

Native Forest



1.487

Riparian Forest



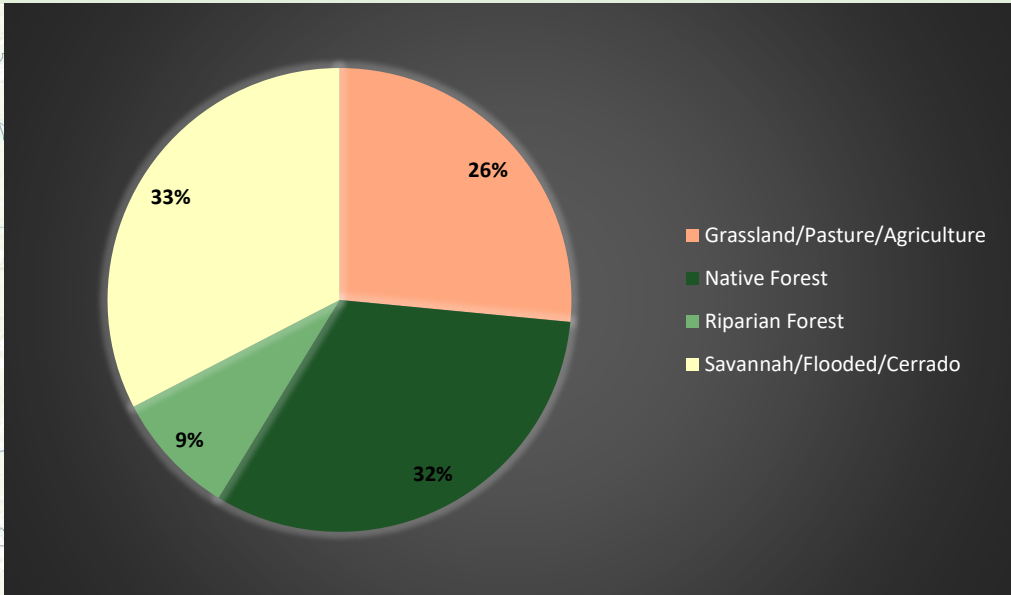
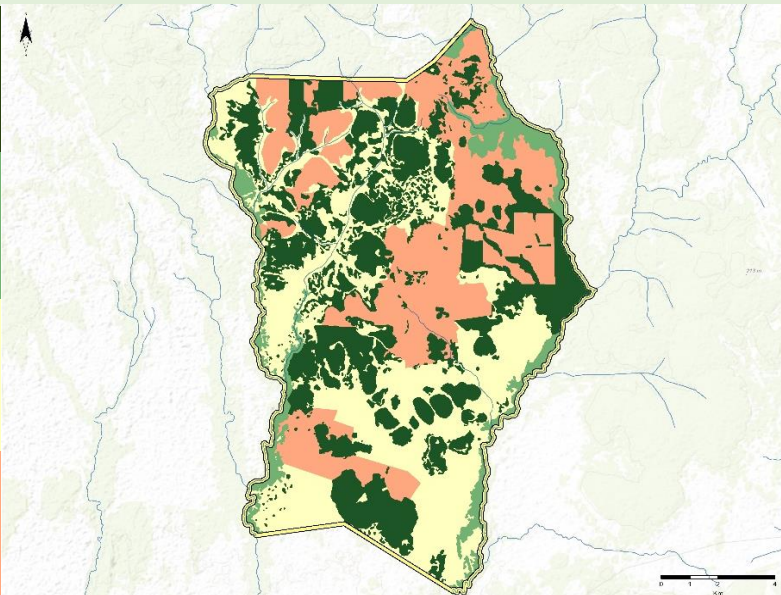
5.603

Savannah/Flooded/Cerrado



4.555

Grassland/Pasture/Agriculture



412

Willer

Total surface (ha)

Forestry-Environmental Analysis

FOREST MANAGEMENT

2%

7

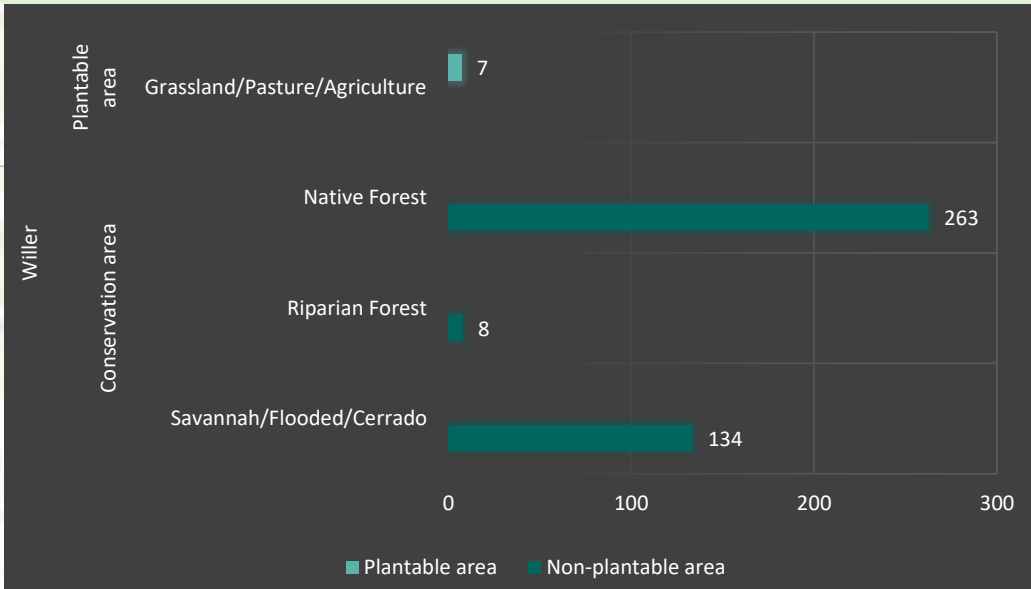
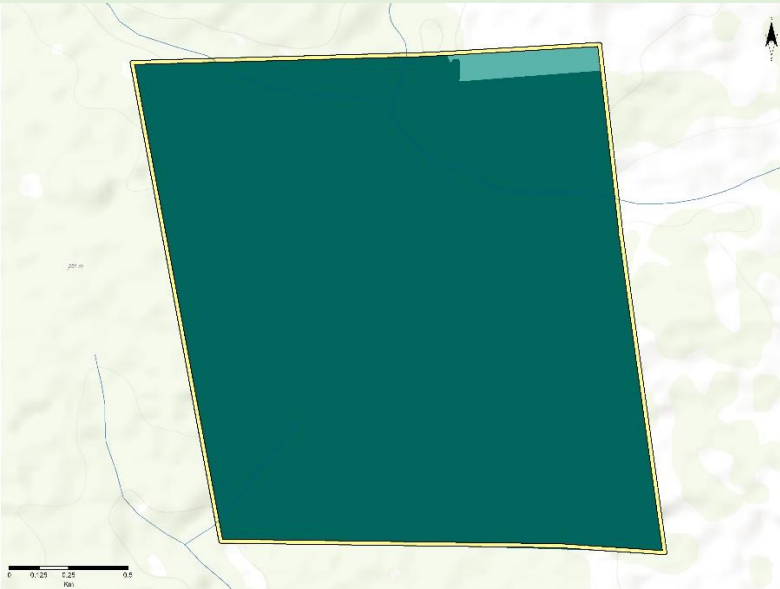
Plantable area



98%

404

Conservation area



LAND USE AND LAND COVER



263

Native Forest



8

Riparian Forest



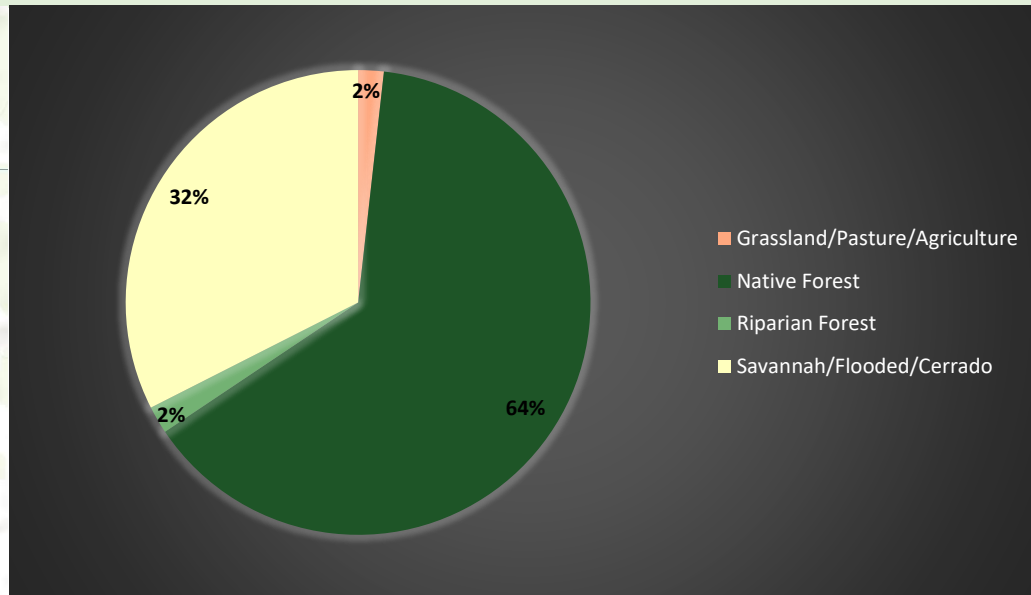
134

Savannah/Flooded/Cerrado



7

Grassland/Pasture/Agriculture



11.213

Zanja Moroti

Total surface (ha)

FOREST MANAGEMENT

7%

841

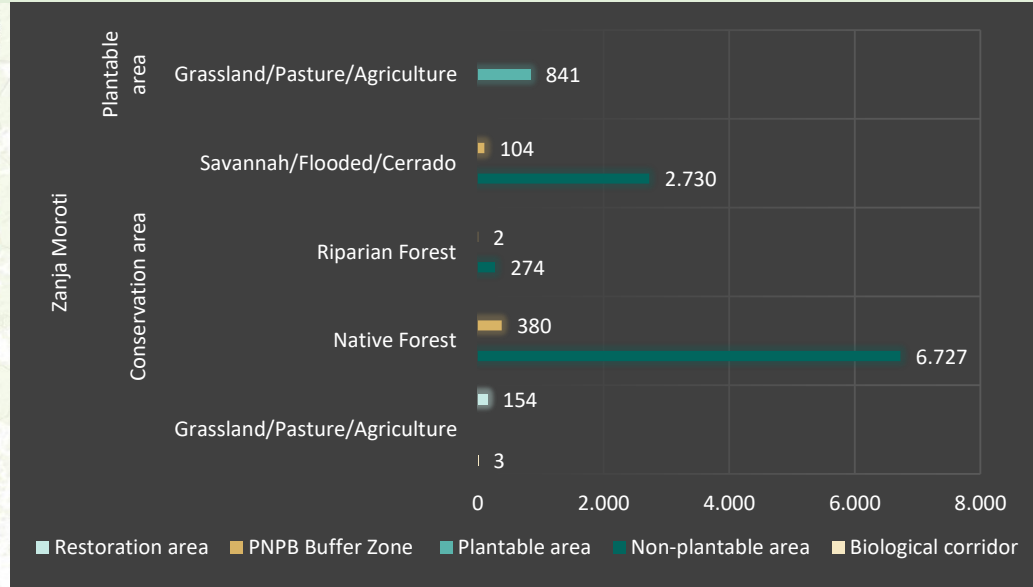
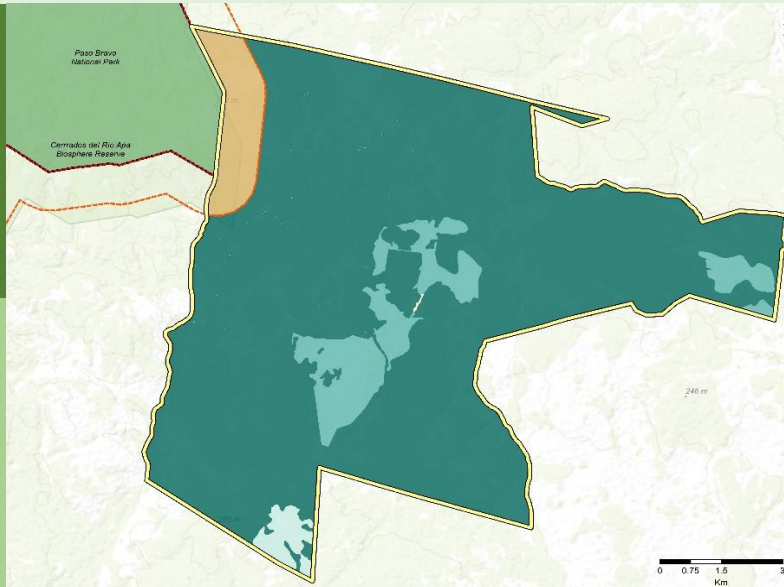
Plantable area



93%

10.373

Conservation area



LAND USE AND LAND COVER

7.106

Native Forest

276

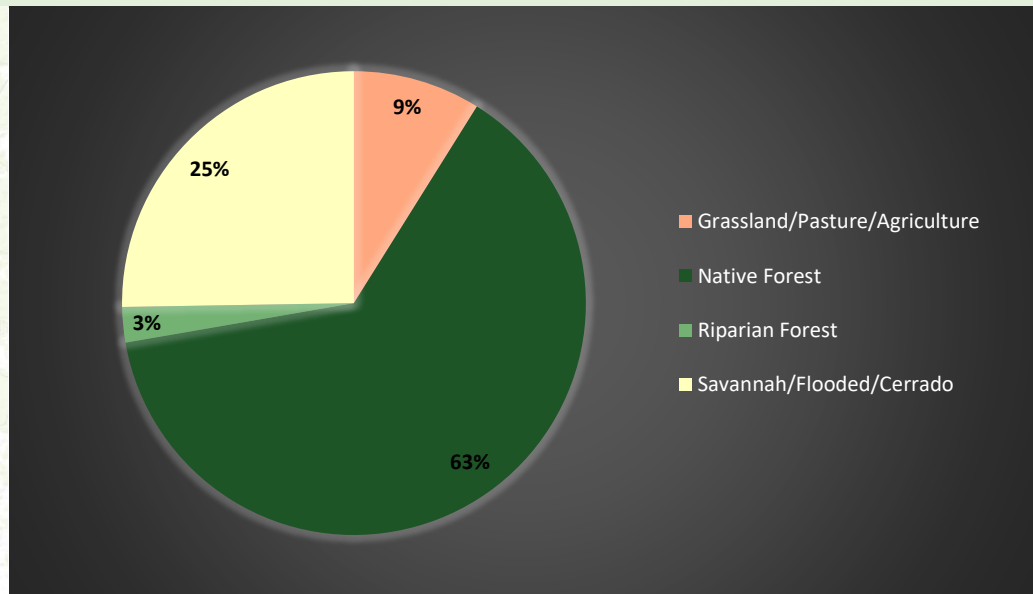
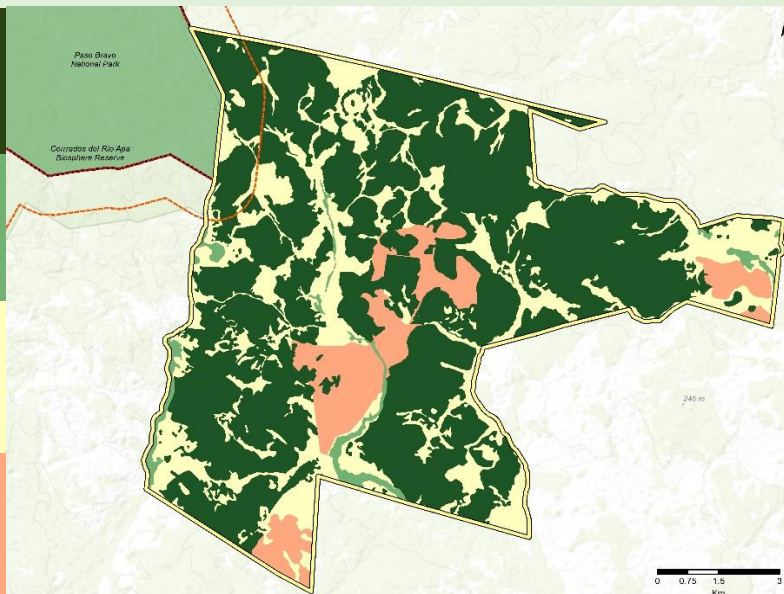
Riparian Forest

2.833

Savannah/Flooded/Cerrado

998

Grassland/Pasture/Agriculture



12.889

Zapallo

Total surface (ha)

FOREST MANAGEMENT

36%

4.639

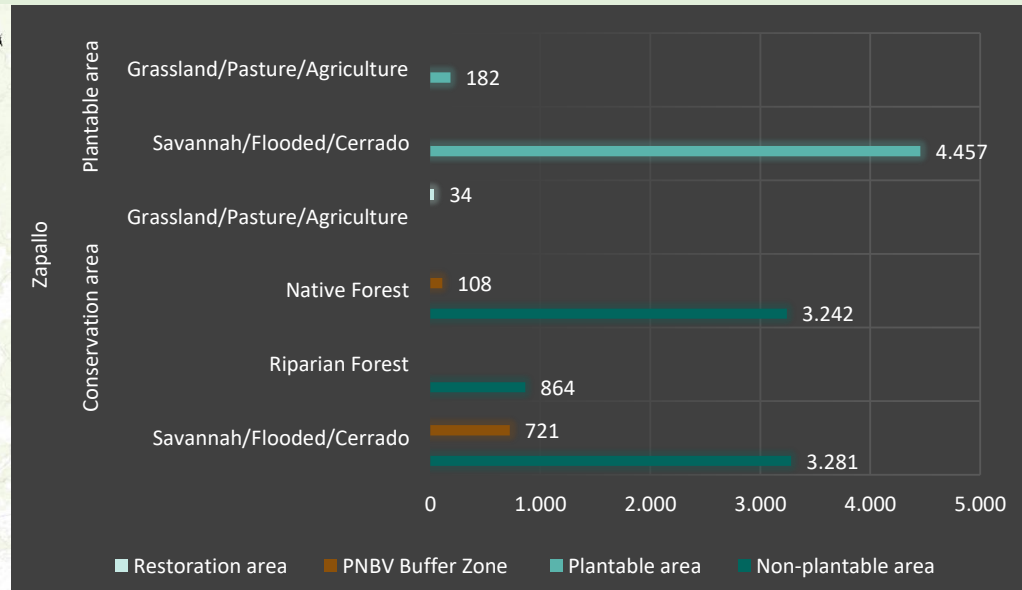
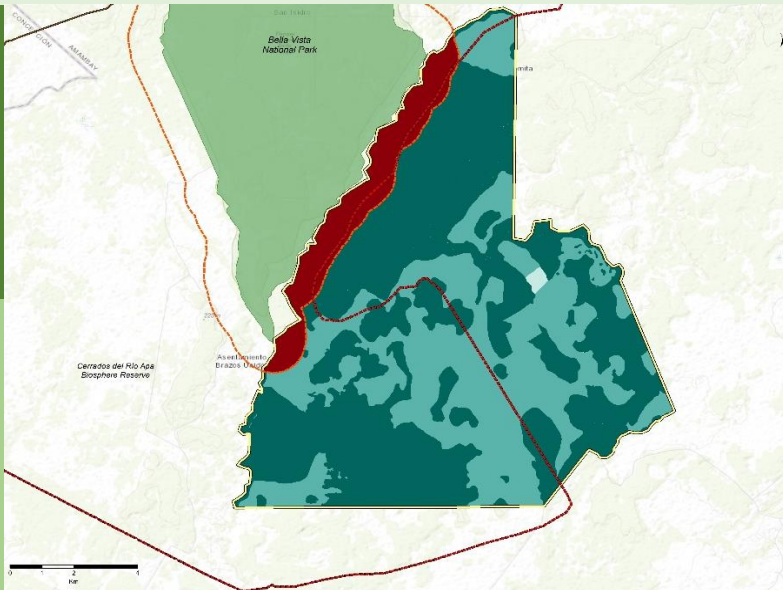
Plantable area



64%

8.250

Conservation area



LAND USE AND LAND COVER



3.350

Native Forest



864

Riparian Forest



8.459

Savannah/Flooded/Cerrado



216

Grassland/Pasture/Agriculture

