

PRY-C 210016

Environmental Due Diligence Report (DD) for the area of interest (AI) of Fund the Planet

Peru | Fund the Planet

FUND THE PLANET

October 2021

Review	Elaborated	Description	Date	Reviewed	Approved
0	MF, CM, RR, DA	Final Report V0	08-10-21	MF	DA

CONTENT

Definitions	5
Abbreviations	6
1.0 Introduction	7
1.1 Due Diligence Scope	7
1.2 Legal and Institutional Framework	9
1.3 Legal Situation of the Area of Study	9
1.4 Cordillera Azul National Park and Its Buffer Zone	10
1.5 Document Review.....	15
1.6 Technical team	15
1.7 Limitations of the Due Diligence	15
2.0 Accessibility and description of Area of Study	16
2.1 Accessibility	16
2.2 Physical Characteristics of the Area of Study	16
2.2.1 Physiography and Landscape	16
2.2.2 Geology	17
2.2.3 Hydrography	17
2.2.4 Weather	18
2.3 Biological Characteristics of Area of Study	18
2.4 Social Characteristics of the Area of Study	19
2.4.1 Sarayacu District	20
3.0 Methodology	22
3.1 Preliminary Study (Phase I)	22
3.2 Field research (Phase II).....	27
3.3 Analysis of Results (Phase III)	28
4.0 Current condition of the study area.....	29
4.1 Protected species.....	29
4.1.1 Vegetation	29
4.2 Fauna	31
4.3 Endemism	34
4.3.1 Vegetation	34

4.3.2 Fauna	34
4.4 Socioeconomic importance	34
4.4.1 Vegetation	34
4.4.2 Fauna	34
4.5 Bird-specific Criteria	35
4.6 Exclusive Criteria for forestry resources	35
4.7 Conservation Status	35
4.8 Social Actors and Communities	37
5.0 Current Soil Use	40
6.0 Potential Carbon Sequestration	43
7.0 Environmental and Social Risks	45
8.0 Conclusions	50
9.0 Recommendations	51
10.0 Bibliography	52

Tables

Table 1. Legal Framework	9
Table 2. Legal Information of the Parcels	10
Table 3. Types of Protected Areas and Complementary Areas	14
Table 4. Technical team of the Due Diligence	15
Table 5. Route 1 Pucallpa-Orellana-Property	16
Table 6. Route 2 Pucallpa-Contamana-Property	16
Table 7. Brief description of vegetation types	19
Table 8. Categories and Scores Assigned for the Protected Species Criterion	23
Table 9. Categories and Scores Assigned for the Endemism Criterion	24
Table 10. Categories and Scores Assigned for the Socioeconomic Importance Criterion	24
Table 11. Categories and Scores Assigned for the Bird-specific Criteria	25
Table 12. Categories and Scores Assigned for the Forest Resources-specific Criteria	26
Table 13. Categories and Scores assigned for the Sensitive-Biological-Areas-(ABS) Criterion	27
Table 14. Chronogram carried on the field research	27

Table 15. Conservation Status in the Area of Study by Vegetation Unit	36
Table 16. Current soil use of the interest area	40
Table 17. Carbon stock in the interest area	43

Figures

Figure 1. Cordillera Azul National Park and Its Buffer Zone	11
Figure 2. Physiography of the area of study	17
Figure 3. Hydrography of the area of study	18
Figure 4. Vegetation units existing in the study area.....	19
Figure 5. Location of Area of Study	20
Figure 6. Loss of forests 2001 – 2020 in Sarayacu and Vargas Guerra districts	22
Figure 7. Indigenous and Peasant Communities	37
Figure 8. Vegetal Cover Registered by Sensor.....	45
Figure 9. Growth of growing areas 2000-2020.....	48
Figure 10. Logging Trail. Opening from Sarayacu to the Area of Interest.....	49
Figure 11. Logging Trail. Opening from the path to the north of the Area of Interest. .	49

Definitions

Forest: Ecosystems in which arboreal species predominate at any development state and their crowns coverage exceeds 10% of the surface in arid and semi-arid conditions, and 25% or more in more favorable circumstances.

Old-growth Forest: Wooded ecosystem with original vegetation, characterized by abundancy of superior and dominant canopy species of mature trees, which have evolved naturally with little human disturbance or natural causes.

Second-growth Forest: It is defined as succession woody vegetation developed on soil originally destroyed by human activities.

Purma: Denomination granted in big part of Peruvian rainforest to the soil coverage equivalent to fallow (technical term). Fallow is described as the land resting stage.

Biomass: Group of organic materials generated from photosynthesis or produced in biological chain.

Indicator species: Those that have particular characteristics as sensitivity to pollutants, distribution, abundance, among others. They are used to estimate attributions of other species or environmental conditions.

Protected Natural Area: Continental and/or sea area of the national territory legally recognized, established and protected by the State as such due to their importance for biological diversity conservation among other values.

Buffer zones: zones adjacent to protected areas that, due to their nature and location, require special status in order to ensure the conservation of the protected area.

Environmental Risk: Possibility of an environmental damage due to natural causes or human action.

Current use of soil: arrangements, activities and inputs done by the man in a certain type of coverage of the soil to produce, to change it or maintain it in desired conditions.

Change of use of soil: Conversion of soil coverage constitutes replacement of a type of cover to another, and it is measured by the change of category of one soil to another, such as agricultural expansion, deforestation or change of coverage for urban extension.

Unit of vegetation: homogeneous zones according to physiographic factors and present vegetal communities characterized by their floristic composition and their physiognomy.

Sensitive Biological Areas: Zones of territory with a high ecosystem value since they allow fertilization, haven, or feeding of wildlife, for example: saladeros, anthills, mound-building termites, bathtubs, trough, breeding places, "collpas".

Abbreviations

PNA	Protected Natural Area
BZ	Buffer Zone
PNCAZ	Cordillera Azul National Park
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
IUCN	International Union for Conservation of Nature
ABS	Sensitive Biological Area
AI	Area of interest
MINAGRI	Ministry of Agriculture and Irrigation of Peru
SERNANP	The National Service of Natural Areas Protected by the State
SINANPE	National System of Natural Areas Protected by the State
MINAM	Ministry of the Environment of Peru
REDD	Reduction of Emissions from Deforestation and Degradation
GHG	Green House Gas emissions

1.0 Introduction

The objective of the Environmental Due Diligence Report (DD) service for the area of interest (AI) of Fund the Planet to present information regarding the state of conservation of the forests and biodiversity of Fund the Planet's areas of interest in the Sarayacu district, Ucayali province, Loreto department. **Map 1.** Location of the zone of interest.

The area of interest covers approximately 1,456.06 ha and consists of 31 parcels, each one measuring 46 ha on average. Fund the Planet will initially purchase 563.00 ha; no activities will be carried out in these areas.

The Due Diligence was executed in 3 phases. Phase 1 consisted of a review of relevant secondary information concerning the biological, physical, and social aspects of the area of interest, the preparation of thematic maps, and the planning of field work activities. Phase 2 involved conducting the field evaluation in which two sampling sectors were defined that prioritized two sectors of the area of interest. Phase 3 entailed systematizing field and secondary information, which allowed for the evaluation of the state of conservation of the area of interest and the associated risks.

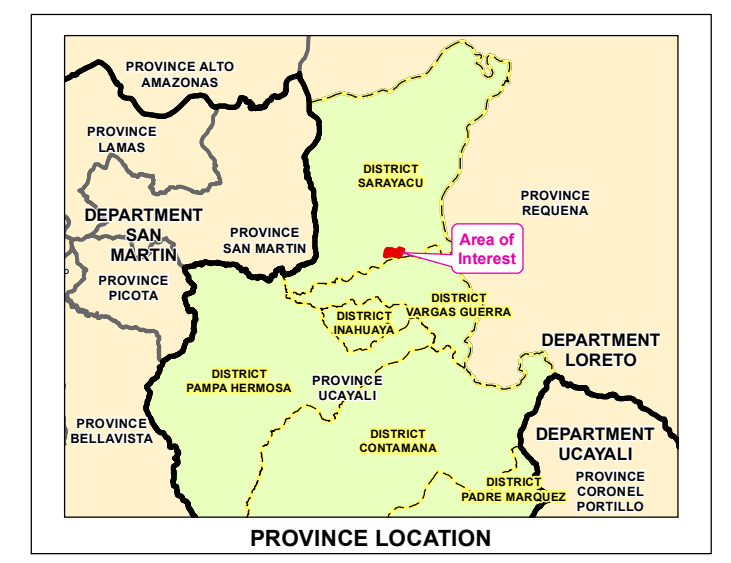
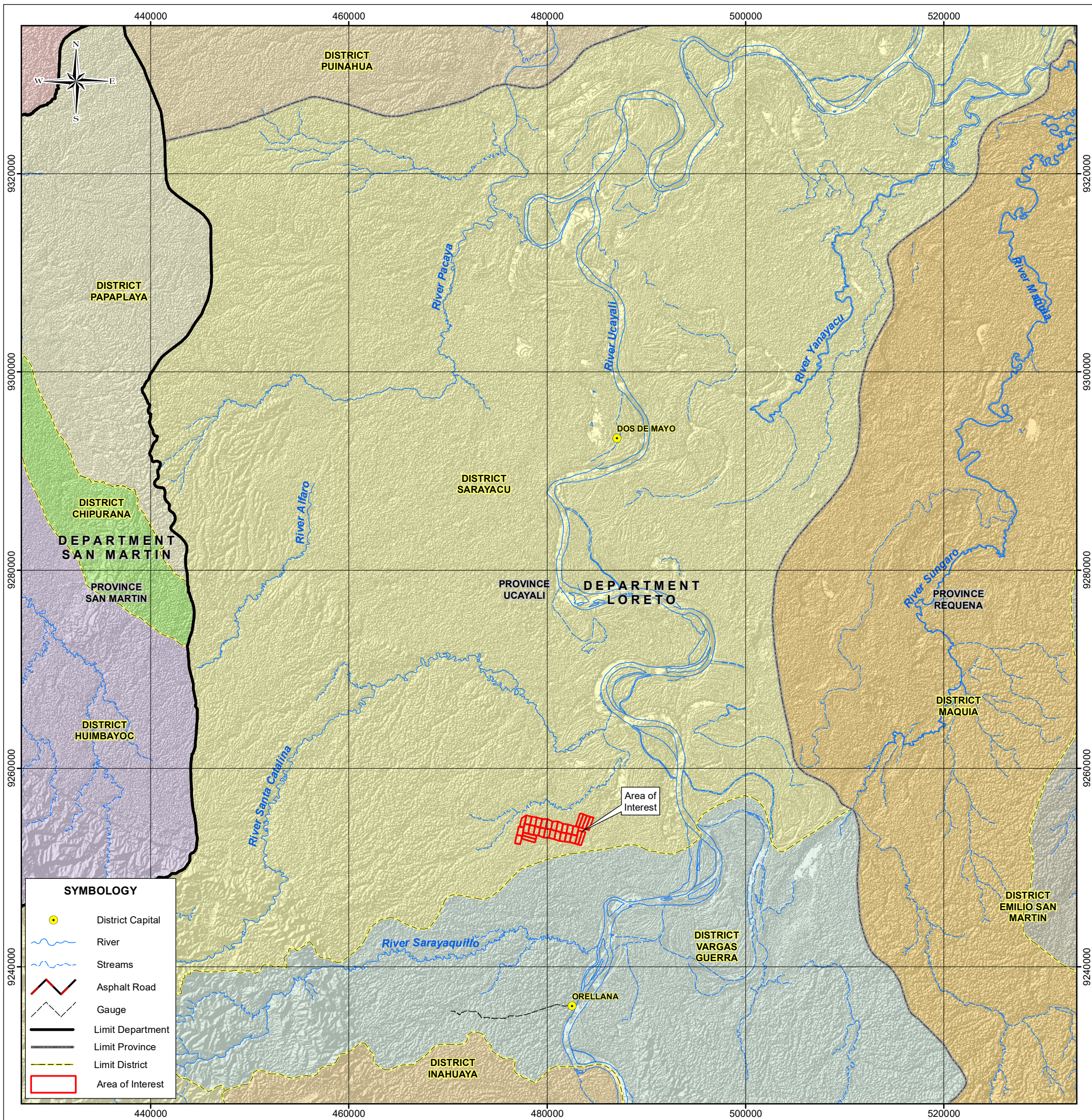
The field evaluation was carried out in the "low-hill forest" and "low-terrace forest" vegetation cover, these being the most representative of the area of study. The evaluated zones are considered the most critical in terms of conservation since they are subject to anthropogenic stress, such as proximity to population centers and the presence of access. Thus, the level of conservation of these zones gives us a reliable reference of the state of the entire area of study.

The review of secondary information and the field evaluation indicate that the zone of interest exhibits a good state of conservation of the vegetation cover, with the presence of fauna indicating the proper functioning of the ecosystem itself. However, in the evaluated sectors and in the field, disturbed areas were observed due to farming and logging, among other threats described in the report.

1.1 Due Diligence Scope

The scope of the Due Diligence was the following:

- Evaluation of the vegetation and fauna component in the predominant vegetation formations in the area of interest through sampling in the prioritized sectors and exploration of the areas of interest.
- Characterize the biological conditions and the social environment of the area of study.
- Identify the socioenvironmental risks that could affect the current conditions of the forests located within the area of study and its surroundings.
- The report includes 8 chapters and maps drawn to a scale of 1:50,000 and 1:25,000.



Environmental Due Diligence report (DD) for the area of interest (AI) of Fund The Planet

TITLE:

LOCATION FOR THE AREA OF INTEREST

Escala 1:400,000
 0 2.5 5 10 15 20 Km
 Projection: UTM; Datum: WGS 84; Zone: 18 South

CLIENTE:
FUND THE PLANET

ELABORATED BY: ASD	PROJECT: PRY-C-21001	DATE: SEPTEMBER 2021	MAP: 01	SHEET: 01
------------------------------	--------------------------------	--------------------------------	-------------------	---------------------

SOURCE: INEI (National Institute of Statistics and Informatics), IGN (National Geographic Institute), MTC (Ministry of Transport and Communications).

1.2 Legal and Institutional Framework

Table 1 lists the national and international regulations and guidelines relating to the Due Diligence.

Table 1. Legal Framework

No.	Regulation	Description
1	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between governments. Its purpose is to ensure that international trade in specimens of wild plants and animals does not constitute a threat to the survival of the species.
2	D.S. No. 043-2006-AG Classification of Threatened Species of Wild Flora	Classification of threatened species of wild flora in Peru.
3	D.S. No. 011-97-AG Regulation of the Law on Private Investment in the Development of Economic Activities in the Lands of the National Territory and of the Peasant and Indigenous Communities	Regulation of Law No. 26505 “Law of Lands” which lays down the general principles required to promote private investment in the development of economic activities in the land of the national territory and of the peasant and indigenous communities.
4	D.L. No. 1090 Forests and Wildlife Law	Law that sets standards, regulates, and oversees the sustainable management and use of forest and wildlife resources in the country.
5	Law No. 26834 Protected Natural Areas Law	Law that set standards relating to the management of Protected Natural Areas and their conservation in accordance with Article 68 of the Political Constitution of Peru.
6	D.S. N°004-2014-MINAGRI	Supreme decree that approves the updating of the list of classification and categorization of legally protected wildlife.
7	Law No 26834 General Environment Law	Establishes the principles and basic standards to ensure the effective exercise of the right to a healthy, balanced, and adequate environment for the full development of life.
8	Red List of Threatened Species, International Union for Conservation of Nature (IUCN)	The IUCN Red List of Threatened Species, as a world inventory, provides alerts regarding the state of global biodiversity.

Source: ASD, 2021

1.3 Legal Situation of the Area of Study

A total of 31 parcels, with areas going from 42 to 50 ha, are registered. Fund the Planet selected 12 parcels for the first purchase and the rest (19) will be evaluated for a second round of negotiations with the owner.

The plots are registered with National Superintendency of Public Registries (SUNARP), in the special section for Rural Parcels of the Loreto region, of which a general description is given in **Table 2**.

Table 2. Legal Information of the Parcels

No.	Property Name	Hectares	Record No.	Description
1	Fundo Diego	48	11067565	First purchase
2	Fundo Deysi	48	11067566	First purchase
3	Fundo Gloria	49	11067567	First purchase
4	Fundo Oswaldo	47	11067568	First purchase
5	Fundo Milagros	46	11067569	First purchase
6	Fundo Jovita	45	11067570	First purchase
7	Fundo Otilio	43	11067571	Remaining property
8	Fundo Talmi	46	11067578	First purchase
9	Fundo Satalaya	47	11067579	First purchase
10	Fundo Hipólito	46	11067580	First purchase
11	Fundo Cachique	46	11067581	First purchase
12	Fundo Paima	48	11067582	First purchase
13	Fundo Inés	47	11067583	First purchase
14	Fundo Elena	46	11067584	Remaining property
15	Fundo Alva	42	11067585	Remaining property
16	Fundo Teddy	46	11067586	Remaining property
17	Fundo Miguel	46	11067587	Remaining property
18	Fundo Aquiles	49	11067557	Remaining property
19	Fundo Oscar	49	11067558	Remaining property
20	Fundo Dani	49	11067559	Remaining property
21	Fundo Hugo	46	11067560	Remaining property
22	Fundo Geni	45	11067561	Remaining property
23	Fundo Orlando	46	11067562	Remaining property
24	Fundo Ángel	47	11067563	Remaining property
25	Fundo Cintia	45	11067572	Remaining property
26	Fundo Aldo	50	11067573	Remaining property
27	Fundo Manuel	45	11067574	Remaining property
28	Fundo Lopez	44	11067575	Remaining property
29	Fundo Bustamante	45	11067576	Remaining property
30	Fundo David	46	11067577	Remaining property

Source: Fund the Planet, 2021

1.4 Cordillera Azul National Park and Its Buffer Zone

The zone of interest is located within the Buffer Zone (BZ) of the Cordillera Azul National Park (PNCAZ). This Protected Natural Area (PNA) safeguarded by the state was created in 2001 and occupies an area of 1,353,190.85 ha and is located between the Huallaga and Ucayali rivers, in the departments of San Martín, Loreto, Ucayali, and Huánuco (**Figure 1**).

PNCAZ is the fourth largest National Park¹ in Peru and protects the largest stretch of intact highland rainforest in the country. Its impressive beauty is due in part to its particular geographical characteristics such as its altitudinal gradient, from the highland rainforest to the Amazon plains, which allows for the concentration of a unique diversity of flora and fauna and where one can also find a large amount of species endemic to the region.

The BZ of PNCAZ are zones adjacent to the PNA, which require special treatment to guarantee the conservation of the protected area due to their nature and location. The purpose of the BZ is to reduce the negative factors affecting the PNA by means of the development of economic activities that are friendly to and compatible with the environment, thereby simultaneously improving and restoring the environmental services that are lost in the BZ.

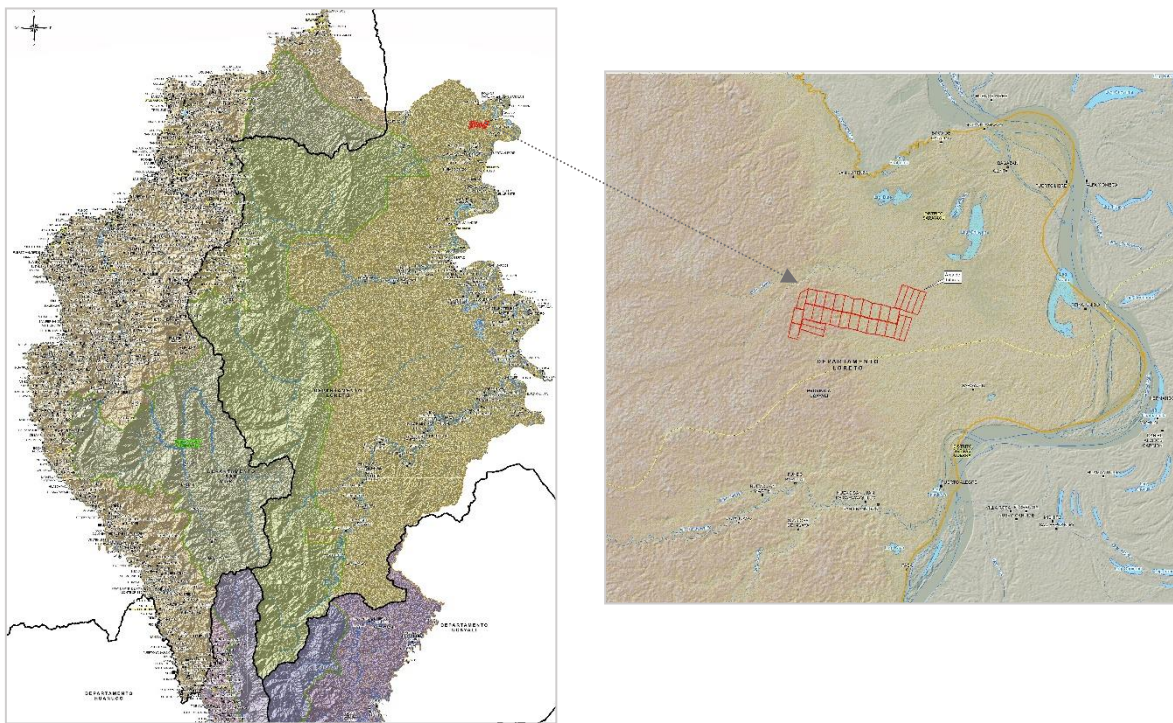


Figure 1. Cordillera Azul National Park and Its Buffer Zone

Adapted from: National Service for Protected Natural Areas (SERNANP), 2021.

Among the main threats to the PNCAZ and its BZ is the loss of biodiversity due mainly to the loss of forests as a result of the advance of farmlands, which is directly related to the population increase in the BZ of the PNCAZ. The migration to the BZ of the PNCAZ has generated an increase of 180 population centers in 2003 and over 530 population

¹Continental or marine areas of the national territory that are legally recognized, delimited, and protected by the state as such, due to their importance in conserving the biological diversity and other related values of cultural, scenic, and scientific interest, as well as their contribution to the sustainable development of the country.

As stated in Article No. 68 of the Political Constitution of Peru: “The state is obligated to promote the conservation of biological diversity and of Protected Natural Areas.”

centers in 2019, this being the reason behind the anthropogenic stress on the forests (SERNANP, 2020²). **Map 2.** Cordillera Azul National Park and Its Buffer Zone

The PNCAZ maintains a 20-year Total Management Contract³ with the Center for Conservation, Research and Management of Natural Areas (CIMA) non-governmental organization (NGO), aimed at conserving the natural wealth, driving national and international research that contributes to the PNCAZ, promoting territorial development of the BZ of the PNCAZ, and securing long-term funding for the management of the PNCAZ.

In this context, the management of the PNCAZ and its BZ focuses its efforts on keeping these forests intact. This led to the development and implementation, since 2008, of the Reduction of Emissions from Deforestation and Degradation (REDD) Project of the PNCAZ, which achieved zero (0.007%) deforestation. This allows it to obtain over 1.6 million in CO₂ emission reductions, making it self-sustainable until at least 2018⁴.⁵ According to the International Union for Conservation of Nature (IUCN), the park prevents the emission of an average of 2.5 million tons of CO₂e per year, which have been providing the key funding for the park's conservation through a REDD+ project, in association with the Althelia Climate Fund.

REDD Project protects 1,351,963.85 ha of highly threatened Andean-Amazonian montane, transitional and lowland forests within the Cordillera Azul National Park that the Peruvian Government has authorized CIMA to manage, thus generating climate benefits

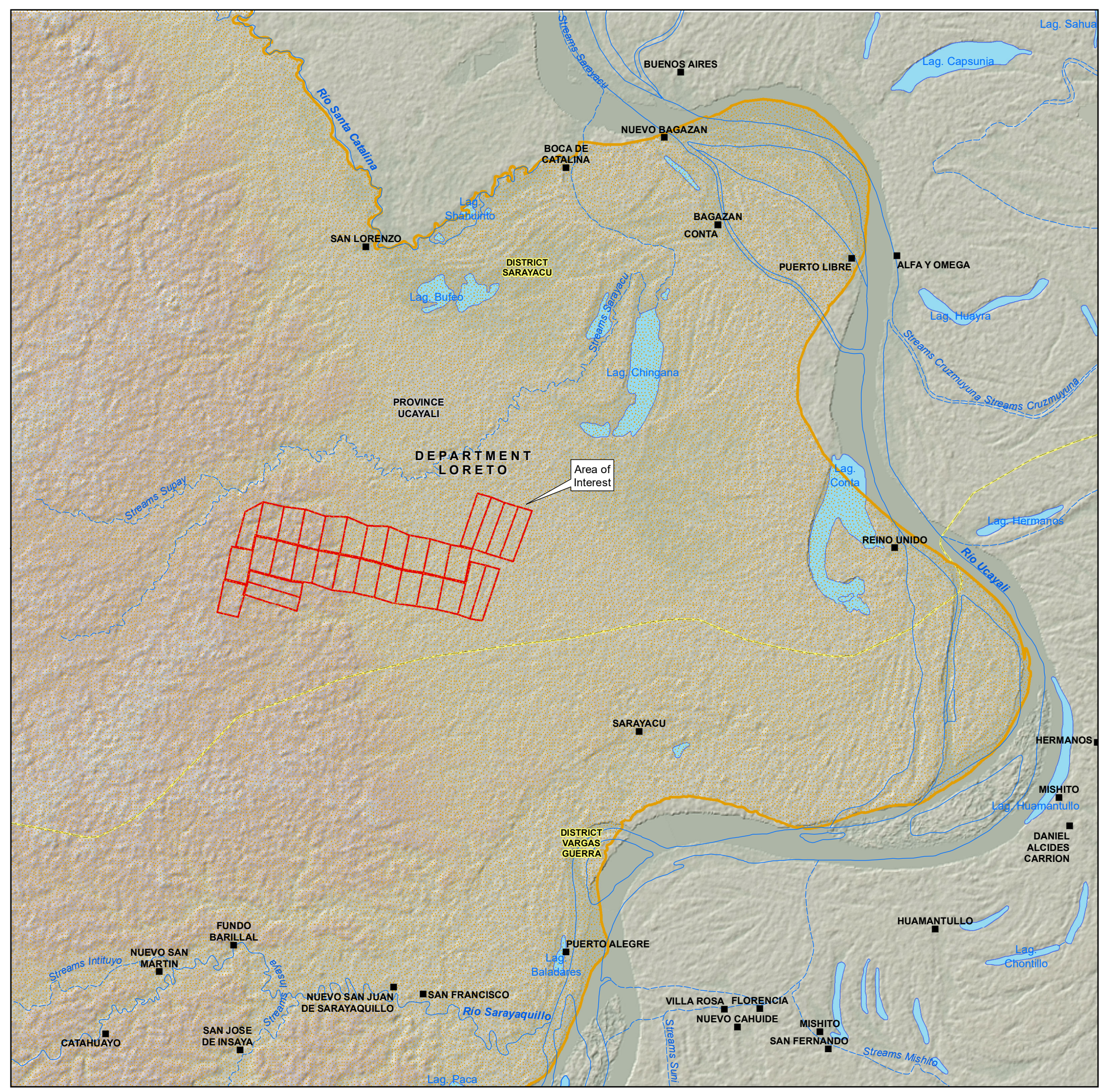
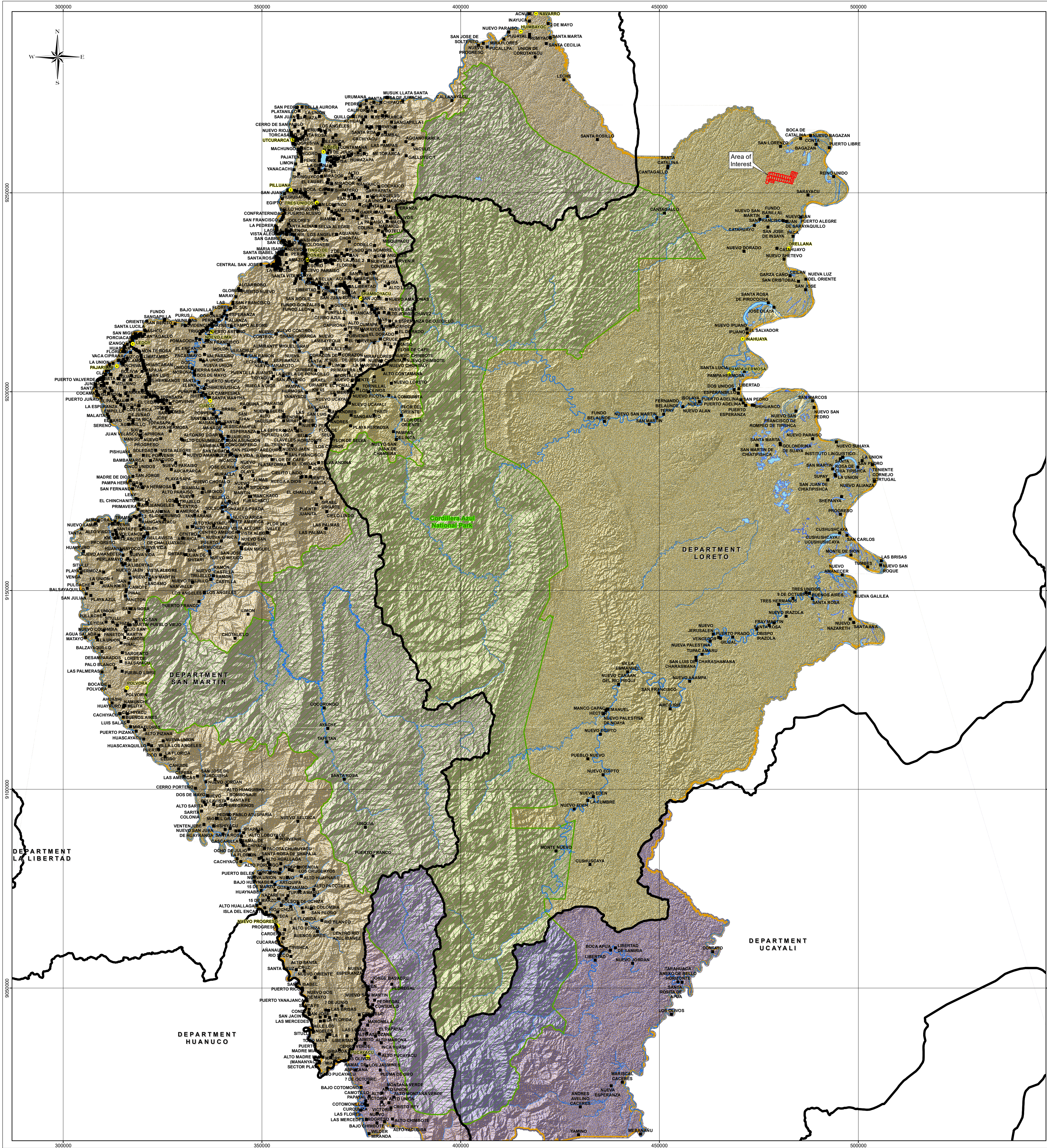
For the first implementation period (August 2008 – August 2012), the PNCAZ REDD Project verified a total net emission reduction of 6,413,412 tCO₂-e. For the second implementation period (August 2012 – August 2014), the GHG emissions net reduction was of 4,606,143 tCO₂-e (when deductions for non-permanence risks, the available 4,145,529 tCO₂-e are reached).

During the monitoring period between August 8th 2012 to August 7th 2014, there has been no anthropogenic deforestation (only limited natural landslide disturbance) nor forest degradation in the Project area, and net GHG emissions reduction was 3,374,249 tCO₂-e. During the previous monitoring periods (2008-2014), the Project sold a small number of Verified Carbon Units in the volunteer market; however, in November 2014, CIMA signed a Loan Contract and Agency Contract with Althelia Climate Fund (ACF); both are backed by the carbon credits that REDD+ PNCAZ Project has generated in 2008-2012 as well as those generated until 2018.

² This entity is charged with directing and establishing the technical and administrative criteria for the conservation of Protected Natural Areas (PNAs).

³ The PNCAZ is the only PNA in the country that maintains a management contract (since 2008 to 2028) with an organization from the civil society.

⁴ The PNCAZ REDD Project Baseline begins in 2008 (project launch date as of the signing of the CIMA-SERNANP Management Contract) and lasts 10 years up until 2018, date on which it must be updated or adjusted according to the national emissions benchmark.



SYMBOLY

- District Capital
- Populated
- ~ River
- ☾ Lakes, cochas
- ▭ Protected Natural Area
- ▭ Buffer zone
- Limit Department
- ▭ Area of Interest

Environmental Due Diligence report (DD) for the area of interest (AI) of Fund The Planet

TITLE:
CORDILLERA AZUL NATIONAL PARK AND ITS BUFFER ZONE

Scale 1:500,000
 0 5 10 20 30 40 50 Km
 Projection: UTM; Datum: WGS 84; Zone: 18 South

CLIENTE:
FUND THE PLANET

ELABORATED BY: ASD	PROJECT: PRY-C-21001	DATE: SEPTEMBER 2021	MAP: 02	SHEET: 01
------------------------------	--------------------------------	--------------------------------	-------------------	---------------------

SOURCE: INEI (National Institute of Statistics and Informatics), IGN (National Geographic Institute), MTC (Ministry of Transport and Communications).

It is important keep in mind that Peru's protected areas are divided into three types according to who administers them:

Protected Natural Areas (PNAs) are managed by the national government through the National System of Natural Areas Protected by the State (SINANPE).

Regional Conservation Areas (RCAs) are managed by the regional governments. These areas have significant ecological importance but do not qualify as SINANPE areas, but rather complement them.

Private Conservation Areas (PCAs) are managed by private individuals.

The categories vary gradually depending on the protection objectives. Areas as classified as direct use areas or indirect use areas based on their legal status, aim, and permitted use as shown in **Table 3**.

Direct Use Areas are intangible protected areas in which natural resource extraction as well as all kinds of modifications of the natural environment are prohibited. The only activities permitted in these areas are non-manipulative scientific research and tourism, recreational, educational, and cultural activities, under duly regulated conditions.

Indirect Use Areas are areas in which the use of natural resources is permitted, primarily by the local population, according to the guidelines of an approved Management Plan and supervised by the appropriate national authority.

Table 3. Types of Protected Areas and Complementary Areas

Type	Category	Management	Type of Use
Protected Natural Areas	Regional Conservation Area	Regional Government	Direct
	Private Conservation Area	Private Individuals	
	National Park	SINANPE	Indirect (Intangible)
	National Sanctuary		
	Historical Sanctuary		
	National Reserve		Direct
	Scenic Reserve		
	Protected Forest		
	Communal Reserve		
	Game Reserve		
	Wildlife Refuge		
	Reserved Zone*		
Buffer Zone*		Buffer	

*These are not considered Protected Natural Areas, but their regulation is related to the PNAs.

Source: Prepared by ASD (2020).

1.5 Document Review

This section lists the documents that were reviewed to prepare the Due Diligence.

- Registry record of the parcels of the area of interest
- Cordillera Azul National Park Master Plan (2011-2016)
- Cordillera Azul National Park Master Plan (2003-2008)
- Country Map of Vegetation Cover, Ministry of Environment (MINAM) (2015)
- Cordillera Azul: Peru's Natural Legacy to the World. PNCAZ REDD+ Project Experience
- Final National Census Reports 2017 - Loreto
- Final Reports: Economically Active Population 2017 - Loreto
- The IUCN Red List of Threatened Species, Version 2021-1.

1.6 Technical team

In **Table 4** we present the ASD technical team that participated in the Due Diligence.

Table 4. Technical team of the Due Diligence

N°	Name	Specialty	Position
1	Denis Arica	Forests and Water Resources	Project Manager
2	Mariella Ferreyra	Biodiversity Conservation	Conservation of the area of study
3	Claudia Mayorga	Biologist	Information systematization
4	Rodrigo Rivera	Geographic Information System	Satellite images and thematic maps
5	Ian Paul S. Medina	Fauna Specialist	Mammals, herpetofauna and ABS field evaluation
6	Patrick A. Pérez	Ornithology specialist	Avifauna field evaluation
7	Carlos G. Hidalgo	Flora and Carbon Quantification Specialist	Flora and carbon biomass field evaluation
8	José A. Aguilar	Forest Specialist	Forestry field evaluation
9	Carlos A. Zarate	Social/Logistics	Stakeholder interviews and fieldwork logistics

Source: ASD, 2021

1.7 Limitations of the Due Diligence

Among the main limitations of the Due diligence are the following:

- There is no previous primary information recorded in the same area of interest to compare with the results of the field evaluation of the vegetation and fauna components.
- Rapid assessment, which is based on sampling in three prioritized sectors according to the vegetation units presented in the area of study, a forest inventory or detailed biodiversity study has not been carried out in all the properties.

- The people and authorities interviewed in the centers of Orellana and Sarayacu, especially in Sarayacu, avoided providing information on the use of natural resources in the territories near their towns, especially illegal timber extraction and crop production.
- Within the area of study, there are no defined entrances or "trails" to the properties and opening these entrances would have required a greater effort in time and resources. Therefore, we followed the boundaries that determine the limits of the properties for the field evaluation.

2.0 Accessibility and description of Area of Study

2.1 Accessibility

Table 5 and **Table 6** show the routes to reach the properties from the city of Pucallpa.

Table 5. Route 1 Pucallpa-Orellana-Property

Section	Transportation	Time	Observation
Pucallpa-Orellana	Boat (85 hp motor slider)	10 hours	The town of Orellana is located 3 hours from the town of Contamana.
Orellana-Property	Motocar	1 hour	Approximately 13 km from Orellana.
	Hiking	4 hours	Travels along existing trails

Source: ASD, 2021

Table 6. Route 2 Pucallpa-Contamana-Property

Section	Transportation	Time	Observation
Pucallpa-Contamana	Airplane	0.5 hr	The town of Orellana is located 3 hours from the town of Contamana.
Contamana-Orellana	Boat (85 hp motor slider)	3 hours	It is difficult to get available boats for transportation from Contamana to Orellana.
Orellana-Property	Motocar	1 hour	Approximately 13 km from Orellana.
	Hiking	4 hours	Travels along existing trails

Source: ASD, 2021

2.2 Physical Characteristics of the Area of Study

2.2.1 Physiography and Landscape

The area of interest presents a changeable and original landscape, dominated by a gently rolling topography and hills whose topography reaches heights of 30 to 300 m in elevation between the top and the base. The area of interest is dominated by low terraces and low hills, which are used for clean crops, forestry and protection. According to **Figure 2**, to the west of the area of interest there are zones with elevations that exceed 1,200 meters above sea level; these elevations are part of the PNCAZ. The zone of interest is at an average elevation of 120 meter above sea level.

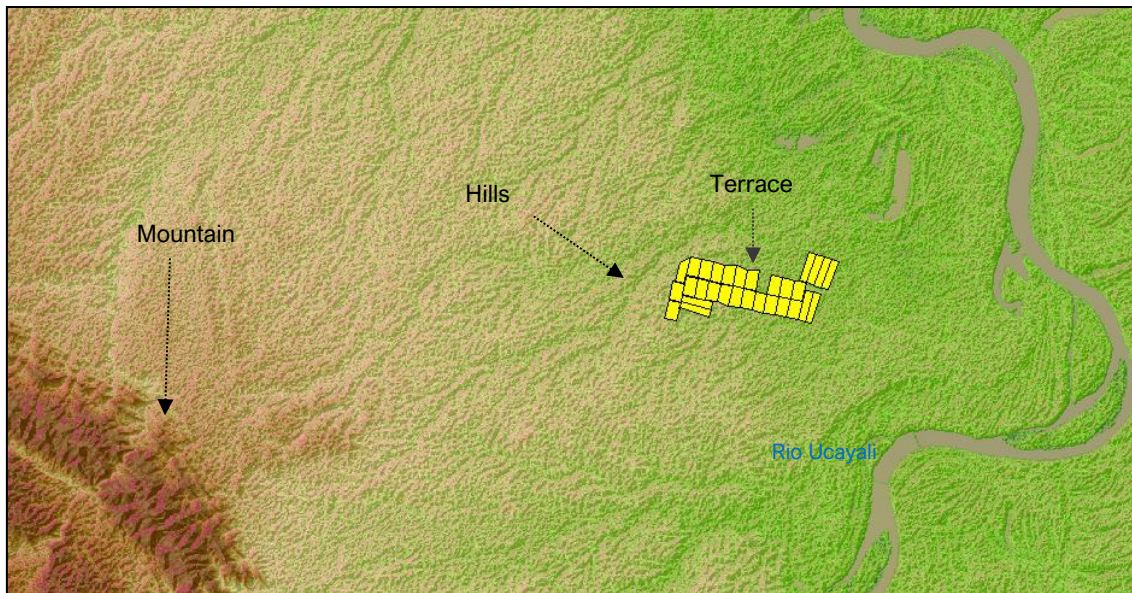


Figure 2. Physiography of the area of study

Source: Bing Satellite

2.2.2 Geology

The study area includes parts of two large morphostructural units of the country, known as the Sub-Andean Belt and the Amazonian Plain, which present different geohistorical development, structures, altitude and lithology, as well as a varied topography that ranges from abrupt and steep mountains to hills and alluvial plains.

2.2.3 Hydrography

Because of its mountainous topography, most of the hydrographic network is found in Cordillera Azul National Park, which is made up of headwaters. The headwaters are represented by bodies of water (streams, creeks, rivers) that are formed in the high mountains due to the condensation of cloud cover, precipitation and runoff, and that give rise to the main rivers in the lowlands.

The study area is located on the slopes of the Ucayali River, one of the large Amazon basins. In the northern zone we find the Supay and Sarayacu streams, the Chingana and Bufe Lagoons, the Sarayaquillo River in the south, and in the east, a hydromorphic "swamp" formation, the Conta Lagoon and the Ucayali River (**Figure 3**).

Table 7. Brief description of vegetation types

Vegetation types	Description
Low hill forest of medium vigor	Forest with a top cover > 90 %, with mostly medium diameters and occasionally large diameters. Shows a moderate timber potential.
Low hill forest of low vigor	Forest with a top cover > 90 %, with generally small diameters and occasionally medium diameters. Shows a low timber potential.
Low terrace forest of medium vigor	Forest with a top cover > 80 %, with mostly medium diameters and occasionally small diameters. Shows moderate timber potential.
Low terrace forest with low vigor	Forest with a top cover < 50 %, with mostly small diameters and occasionally medium diameters. Shows a low timber potential.
Flooded palm forest	Forest dominated by palm trees with > 90% top cover.
Others	
Deforested area	Area cleared by agricultural activity

Source: Ministry of Environment (MINAM, 2015)

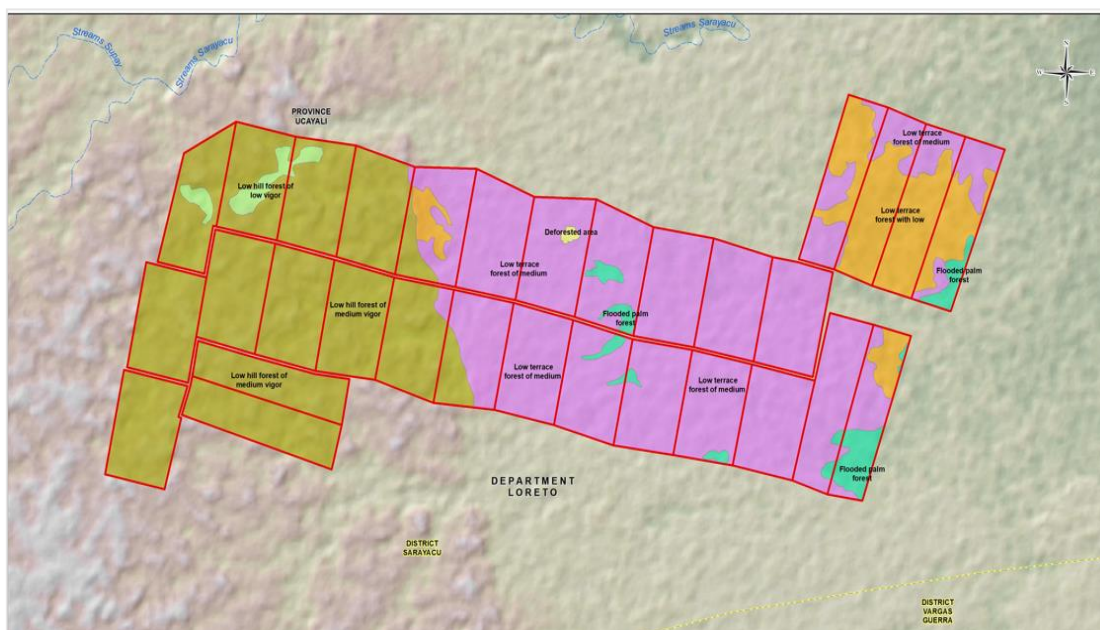


Figure 4. Vegetation units existing in the study area

Source: ASD, 2021- Satellite imagen Bing

2.4 Social Characteristics of the Area of Study

The area of interest is located within the district of Sarayacu, in the province of Ucayali, department of Loreto. Heading south, the district of Vargas Guerra is located less than 5 km away (**Figure 5**).

The population centers near the area of interest are usually located on the banks of the Ucayali (Orellana, Paca, Puerto Alegre, Reino Unido, Sarayacu, Puerto Libre, Nuevo Bagazan) and Sarayaquillo (Nuevo San Juan de Sarayaquillo, San Francisco, San Martin, Nuevo Catahuayo) rivers.

We consider that the villages of Orellana and Sarayacu that belong to the districts of Vargas Guerra and Sarayacu, would be a direct influence to the area of interest, because the population of these villages has access to the properties through existing trails and also generally carry out economic activities (hunting, timber extraction and crop production) close to the areas of interest.

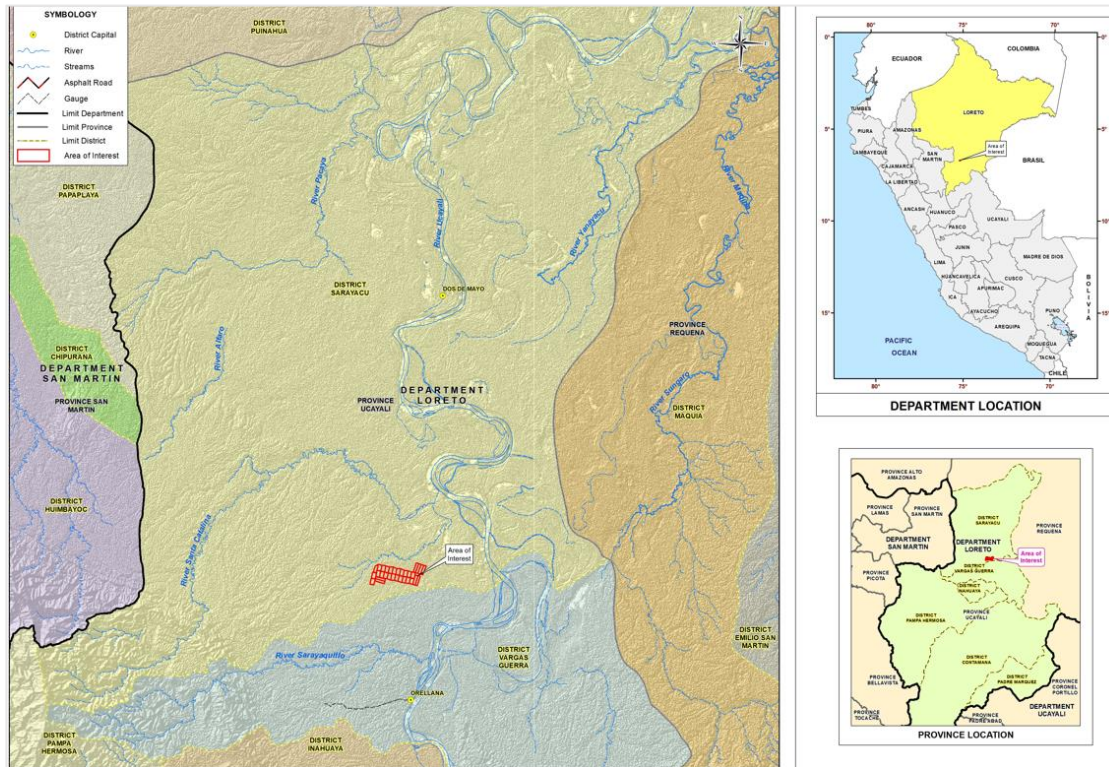


Figure 5. Location of Area of Study

Source: National Geographic Institute

Below is a summary of the most relevant social and economic characteristics at the district level.

2.4.1 Sarayacu District

According to the National Census (INEI, 2017), this district has a total population of 13,464 people, from which 5,324 are urban population and 8,140 rural population.

Ninety-seven percent of the population speaks Spanish, 2.5% speaks another native language, and 0.15% speaks Shipibo-Conibo. Eighty-six percent (86%) of the men and eighty-three percent (83%) of the women can read and write. Fifty percent (50%) of the population has elementary education, thirty-one percent (31%) has high school education, and nine percent (9%) has preschool education. A total of seventy-five percent (75%) of the population between the ages of 3 and 24 currently attends an educational institution.

A total of 2,968 people twenty-two (22%) are heads of household. Out of the total number of residents, seventeen percent (17%) do not have any type of health insurance.

Out of the total population, thirty percent (30%, 4089 people) belong to the Economically Active Population (EAP), but only twenty-eight percent (28%, 3874 people) are currently working. Among their main economic activities, sixty-four percent (64%) are engaged in agriculture, farming, forestry, and fishing activities and fifteen percent (15%) work as unskilled workers (pawn, street sellers, and others). Out of the total population, seventy six percent (76%) are self-employed or work in the informal sector.

2.4.2 Vargas Guerra District

The area of study is located less than 5 kms from Vargas Guerra District. According to the National Census (INEI, 2017), this district has a total population of 6467 people, from which 5432 are urban population and 1035 are rural population.

Spanish speakers represent ninety-four percent (94%) of the population while 0.4% are Quechua speakers. The ability to read and write is present in eighty-seven percent (87%) of men and eighty-five percent (85%) of women. The highest educational level obtained by the population is as follows: forty-six percent (46%) elementary, thirty-six percent (36%) high school, and six percent (6%) have no education level. Seventy-five percent (75%) of the 3-to-24-year-old population currently attends to an educational institution.

A total of 1343 people (21%) are head of household. Fifteen percent (15%) of the total population does not have any kind of health insurance.

Of the total population, thirty-four percent (34%, 2,182 people) belong to the Economically Active Population (EAP); however, only thirty percent (30%, 1,975 people) is currently working. Among the main activities, thirty-four (34%) works in agriculture, farming, forest and fishing activities, and twenty-four percent (24%) performs non-qualified jobs (pawn, street seller, and related). Out of the total population, fifty-eight percent (58%) works independently or is self-employed.

It is important to mention that both districts have shown an increase on the settler population that is located in the riverside of the Ucayali River, which pushes forests to change their use to agriculture and wood extraction. In this sense, according to MINAM the loss of forests in Sarayacu and Vargas Guerra districts is of 13822 and 12206 hectares between 2001 and 2020 as it is shown in **Figure 6**.

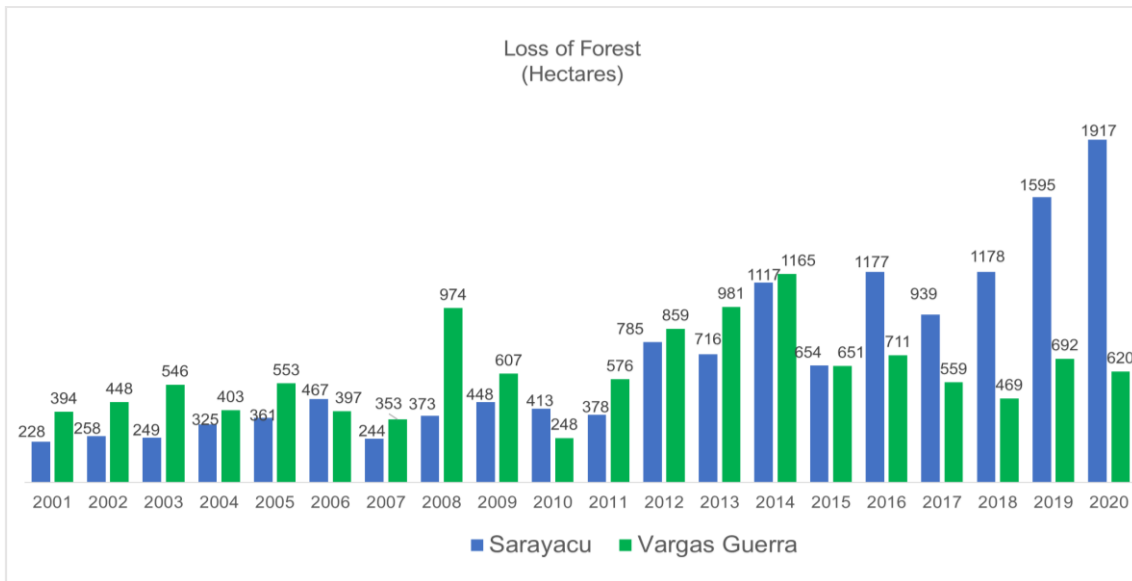


Figure 6. Loss of forests 2001 – 2020 in Sarayacu and Vargas Guerra districts

Source: MINAM-National Program of Forest Conservation for Climate Change Mitigation, 2020

3.0 Methodology

3.1 Preliminary Study (Phase I)

In this first phase, all relevant information for the area of study was collected and systemized. The Due Diligence’s scope and approach was defined. Preliminary themed maps were elaborated, and zones of interest were defined for the field work. The most relevant criteria were determined to define the state of conservation of the area of study.

Employed methodology is detailed hereafter. In parallel, technical specialists with experience in the area of study were contacted. The planning of field work was made. Elaboration of work plan and logistics coordination for their elaboration.

3.1.1 Conservation Status

The most relevant criteria to determine the conservation status of the area of study were chosen. The methodology applied are detailed below.

Six criteria were chosen to evaluate the importance or degree of conservation of the area of study: 1) protected species, 2) endemism, 3) socioeconomic importance, 4) bird-specific criteria, 5) forest resources-specific criteria and 6) sensitive biological areas, and to this effect, the primary and secondary criteria recommended by Ratcliffe (1977), the species selection criteria according to Eberhardt (1976), and the valued ecosystem components according to Treweek (1999) were considered. It should be noted that there is no standard method or set of criteria for these types of evaluations and due to information restrictions (for example, a lack of scientific knowledge regarding the ecology of the species involved, time limitation and sampling effort), it was not possible to consider all the criteria recommended in the literature.

Each criterion was assigned five conservation categories linked to five numerical scores: very high (10), high (7.5), medium (5), low (2.5), and very low (0). An ascending value was considered according to the degree of importance attributed to each category. Numerical scores were used because, according to Treweek (1999), this allows abstract

criteria to be expressed numerically; this facilitates comparing multiple criteria and decision-making. Greater importance was given to forest resources-specific criteria and protected species criteria. Forest resources-specific criteria are associated with the ecosystem’s structure (measured as biomass and scores of the vegetation’s vertical structure). The ecosystem’s structure certainly affects its functioning and obvious links exist between the structure of the vegetation and the composition of the associated fauna (Treweek, 1999). On the other hand, protected species are listed in both national and international conservation lists. For this reason, the scores associated with both criteria were multiplied by a double-valued weight.

Criterion 1: Protected Species

This criterion includes species protected by Peruvian law (Supreme Decree 04-2014-Minagri and Supreme Decree 043-2006-AG) as well as species listed on the Red List of Threatened Species (of wild fauna and flora) compiled by the International Union for Conservation of Nature (IUCN, 2021). The legal norms were published in the official daily newspaper El Peruano (2014 and 2016), whereas the Red List is the most complete inventory of the conservation status of plant and animal species in the world.

Table 8. Categories and Scores Assigned for the Protected Species Criterion

Conservation Category	Score	Description
Very Low	0	No registered or potentially present species appear on the conservation lists
Low	2.5	One or more registered or potentially present species are listed, nationally or internationally, in the Data Deficient (DD) and/or Near Threatened (NT) categories
Medium	5	One or more registered or potentially present species are listed, nationally or internationally, in the Data Deficient (DD) and Near Threatened (NT) categories
High	7.5	One or more registered or potentially present species are listed, nationally or internationally, in the threatened categories (VU: Vulnerable; EN: Endangered; CR: Critically Endangered)
Very High	10	One or more registered or potentially present species are listed, nationally or internationally, in the threatened categories (VU: Vulnerable; EN: Endangered; CR: Critically Endangered)

Source: ASD, 2021

Criterion 2: Endemism

Species with a restricted distribution are generally more vulnerable to extinction than those with a wider distribution. This is usually the case of species that require more specific resources and have a lower chance of recovering when faced with damage or loss of habitat.

Table 9. Categories and Scores Assigned for the Endemism Criterion

Conservation Category	Score	Description
Very Low	0	No registered or potentially present species is considered endemic
Low	2.5	One or more registered or potentially present species are considered endemic to a wide geographic distribution (for example, endemic to the Andes Mountains, endemic to the Amazon)
Medium	5	One or more registered or potentially present species are considered endemic to a medium geographic distribution, which includes a basin or more than two departments of Peru
High	7.5	One or more registered or potentially present species are considered endemic to a smaller geographic distribution, which includes just two departments of Peru
Very High	10	One or more registered or potentially present species are considered endemic to a much smaller geographic distribution, which includes just one department of Peru

Source: ASD, 2021

Criterion 3: Socioeconomic Importance (Communal Use)

This criterion considers those species with commercial value and/or importance for subsistence hunting for neighboring populations. Some species are also considered valuable because they are charismatic, emblematic, or important for ecotourism. Species whose international trade is restricted are listed in the CITES appendices.

Table 10. Categories and Scores Assigned for the Socioeconomic Importance Criterion

Conservation Category	Score	Description
Very Low	0	No registered or potentially present species has local socioeconomic importance
Low	2.5	One or more registered or potentially present species are used by the population for a specific purpose of minor importance for their subsistence
Medium	5	One or more registered or potentially present species are used by the population for a specific purpose of moderate importance for their subsistence
High	7.5	One or more registered or potentially present species are used by the population for more than one purpose of moderate importance for their subsistence
Very High	10	One or more registered or potentially present species are used by the population for more than one purpose and is essential for their subsistence

Source: ASD, 2021

Criterion 4: Bird-specific Criteria

These criteria consider the inclusion of species in Important Bird Conservation Areas (IBAs) and Endemic Bird Areas (EBAs) according to BirdLife International (2021). They also consider congregatory species associated with wetlands designated as internationally important according to the Ramsar Convention (Ramsar,2021) and migratory species according to the Convention on Migratory Species (CMS).

Table 11. Categories and Scores Assigned for the Bird-specific Criteria

Conservation Category	Score	Description
Low	2.5	One or more registered or potentially present species are migratory species
		One or more registered or potentially present species are congregatory species – associated with Ramsar sites
Medium	5	One or more registered or potentially present species are species restricted to Important Bird Conservation Areas (IBAs)
		One or more registered or potentially present species are species restricted to Endemic Bird Areas (EBAs)
		One or more registered or potentially present species are migratory species included in the Convention on Migratory Species (CMS)

Source: ASD, 2021

Criterion 5: Forest Resources-specific Criteria

This criterion considers those categories of interest to the forest. According to the FAO (2021), in purely economic terms, the woodlands of the rainforest are the most important for the economic development of the country and of the local populations settled in these forests.

On the other hand, we consider relevant the biomass and carbon stock present in the area of study. According to Martel (2012), the identification of the levels of carbon storage in forested areas and specifically in each vegetation formation would enable better management of the conservation zones, as well as the identification of potential areas useful for financing carbon absorption and other environmental services.

Vegetation cover reduces splash erosion due to interception of rainfall, decreases overland flow, and improves infiltration of precipitation and runoff water into the soil.

Table 12. Categories and Scores Assigned for the Forest Resources-specific Criteria

Conservation Category	Score	Average Vegetation Cover	tC/ha	Presence of individuals of interest to the forest
Very Low	0	0%	<50 tC/ha	No individuals of interest to the forest were recorded
Low	2.5	25%	50<tC/ha<80	Individuals of interest to the forest were recorded DBH<20
Medium	5	50%	81<tC/ha<110	Individuals of interest to the forest were recorded 21<DBH<50
High	7.5	75%	111<tC/ha<130	Individuals of interest to the forest were recorded 51<DBH>80
Very High	10	100%	131<tC/ha	Individuals of interest to the forest were recorded DBH>81

DBH: Diameter at Breast Height.

Source: ASD, 2021

Criterion 6: Biologically Sensitive areas (BSA)

This criterion considers microhabitats that are important for the survival of different groups of animals and plants of Amazonia as **Biologically Sensitive areas (BSA)** according to Thurber et al (2008). A microhabitat is the smallest part of an ecosystem that possesses specific physical conditions that are favorable for distinctive flora and fauna organisms.

According to Thurber et al (2006): “This tropical fauna depends on conservation of the general habitat, but particularly on high functional value microhabitats that provide food, water, minerals, and reproduction areas...Criteria was developed by biologists to define these BSAs in the field based on size of BSA, number and abundance of fauna species using the BSA, and functional importance to each species”. Besides, that study measured the importance of those microhabitats according to their surface and/or relative density:

- Clay Licks o “Colpas” 6-250 m²
- Feeding Areas (“troughs”) 6-200 m²
- Drinking Areas (“water troughs”) 6-1600 m²
- Bathing Areas (“bathingtubs”) 6-500 m²
- Reproduction or Nesting Areas 6-800 m²
- Termite mounds 6-200 m²
- Mammal’s Burrows

Table 13. Categories and Scores assigned for the Sensitive-Biological-Areas-(ABS) Criterion

Conservation Category	Score	Description
Low	2,5	1 BSA was/were registered by transect
Medium	5	2 BSAs were registered by transect
High	7,5	More than 3 BSAs were registered by transect

Source: ASD, 2021

The type of scores allowed to classify the level of conservation of the main vegetation units according to each criterion. The sum of assigned scores allowed to obtain a total score per unit. Five ranges of total score were established, each one associated to a level of conservation: Very High (201-250), High (151-200), Medium (101-150), Low (51-100), Very Low (0-50). These results are present in Section 3.3 Qualification and Results Discussion.

3.2 Field research (Phase II)

Field research consisted of the evaluation of flora, carbon-biomass, forest species and fauna. Zones considered as the most critical were selected according to their state of conservation and the most vulnerable to the identified pressures since they were on the outskirts of the area of study and close to the population centers and ways. Field research was performed from August 19th to August 27th of 2021. The work schedule is shown in **Table 14.**

Table 14. Chronogram carried on the field research

Fr	Sa	Su	Mo	Tu	We	Th
20	21	22	23	24	25	26
Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8
Fluvial transportation (Ucayali River) Pucallpa-Contamana	Fluvial transportation Contamana-Orellana. Transportation by hiking to the area of study and camping installation.	Evaluation Sector 3 (Low Hill Forest of medium vigor)	Evaluation Sector 3 (Low Hill Forest of medium vigor)	Evaluation Sector 2 (Low-terrace Forest of medium vigor)	Evaluation Sector 2 (Low-terrace Forest of medium vigor)	Mobilization the area of study-Orellana-Pucallpa

Source: ASD, 2021

Methodology followed by specialists in field are detailed here.

Floristic composition

Necessary information to determine species composition of the sampling area was collected by plots (20 x 50 m). Corresponding information was registered according to the shaft diameter (D) for every individual ≥ 10 cm, which will be measured 1.3 m height from the ground. Likewise, data of Total Height for each tree was registered, total height measure will be estimated visually.

Points of interest were georeferenced and photographic records were taken. Likewise, the type of vegetation was identified as: old-growth forest, second-growth forest, purma o wood forest. Besides, every sign of deforestation, damage, or imminent risk in the area of study was registered.

Quantification of Arboreal Biomass and Carbon Content

Contained biomass in vegetal components of the plant over the soil (shaft, branches, and leaves) was estimated. Aerial biomass was quantified by allometric equations. To estimate biomass, all registered plants will be categorized in two groups (1) Woody Plants and (2) Plant Trees, this classification is according to equations that are going to be used. To do this, there are two equations previously tested. The equation proposed by Chave *et al.* (2014) was used for Woody Plants.

Forest Inventory

Forest inventory was performed by following the methodology of rectangular plots according to recommendations by the Ministry of Agriculture and Irrigation (MINAGRI). Each plot was divided in 10 sub-units of 25x10m. Parameters to be evaluated were: species, diameter at breast height (DBH), shaft height, total height, shaft's external quality, and sanitarian state. Also, setting characteristics: topographic position, slope, soil texture, type of vegetation, among others.

Fauna Evaluation

To evaluate birds, the lineal transects methodology was followed, which consists of spotting and observing every wild fauna specimen that is in the area of study range, from observing footprints to bone remains of animals found in the area of influence, as well as their photographic records and of species that move around the area of study freely.

To evaluate the herpetofauna, censuses were performed through the VES method, and it will consist of 3 transects of 100 or 200 meters long separated by 50 or 100 meters (distance will depend on accessibility to the zone field), this allowed to have a greater access to evaluate a better register of the herpetological community in the zone distribution. Evaluations were performed for 3 hours during daytime as well as at nighttime.

To evaluate major mammals, lineal transects were performed for direct (direct observation) and indirect (traces and footprints) registers in a route of 2 to 4 kms long during daytime.

For all biological groups, there was a special interest in identifying Sensitive Biological Areas (SBA) such as: collpas, troughs, water troughs.

3.3 Analysis of Results (Phase III)

Biological and social information obtained in field was systemized and processed. With those results, matrixes described in point 3.1 were completed to determine the state of conservation by prevailing vegetal formation in the area of study.

On the other hand, biomass and carbon estimation was performed, whose methodology is detail here.

Biomass and Carbon Estimation

Contained biomass in vegetal components of the plant over the ground (shaft, branches and leaves) were estimated. Aerial biomass was quantified by allometric equations. To estimate biomass, all registered plants were categorized in two groups (1) Woody Plants (trees and bushes) and (2) Plant Trees, this classification is according to equations that are going to be used. To do this, there are two equations previously tested. The equation proposed by Chave et al. (2014) was used for Woody Plants described hereafter:

$$Barb = 0.0559 * (\rho D^2 H)$$

Where Barb is the tree's Biomass, 0.0559 is a constant, ρ is the plant's wood density according to its taxonomical determination (genre and/or species), D is the tree's diameter, and H is the tree's total height. Likewise, palm trees' biomass estimation will be through the equation proposed by Goodman et al. (2013) described hereafter:

$$Bpal = -2.0752 + (2.6401 * Ln(D)) + (0.8426 * Ln(\rho))$$

Where Bpal is each palm tree's biomass in the plot, -2.0752; 2.6401 and 0.8426 are constant factors of the equation, D is the palm tree's diameter, and ρ is the palm tree's shaft density. Density information will be obtained from the Global Wood Density database (Zanne et al. 2009) and Goodman et al. (2013). The total areal biomass of the plot will be obtained as a result of the sum of biomass of each individual registered in the plot.

Carbon content in vegetal components is estimated having the plot's biomass as the source. For carbon content estimations at a forest level like the one done in the sampling area, an equivalent of 50% of biomass is applied, meaning that carbon present in shafts, branches and leaves represent 50% of biomass estimated for each individual registered in the plot.

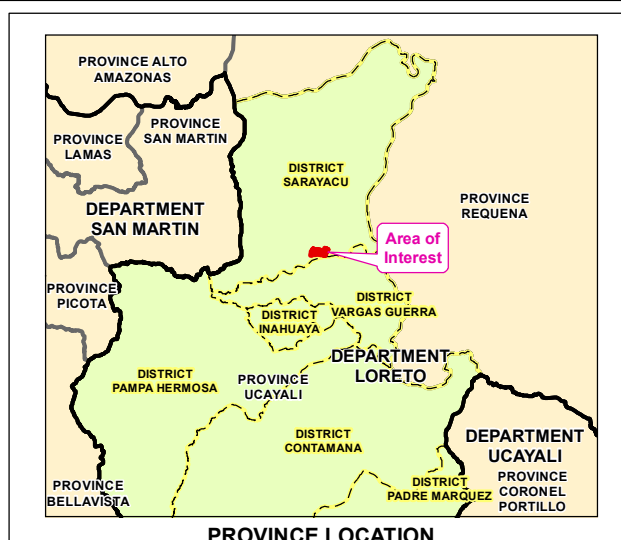
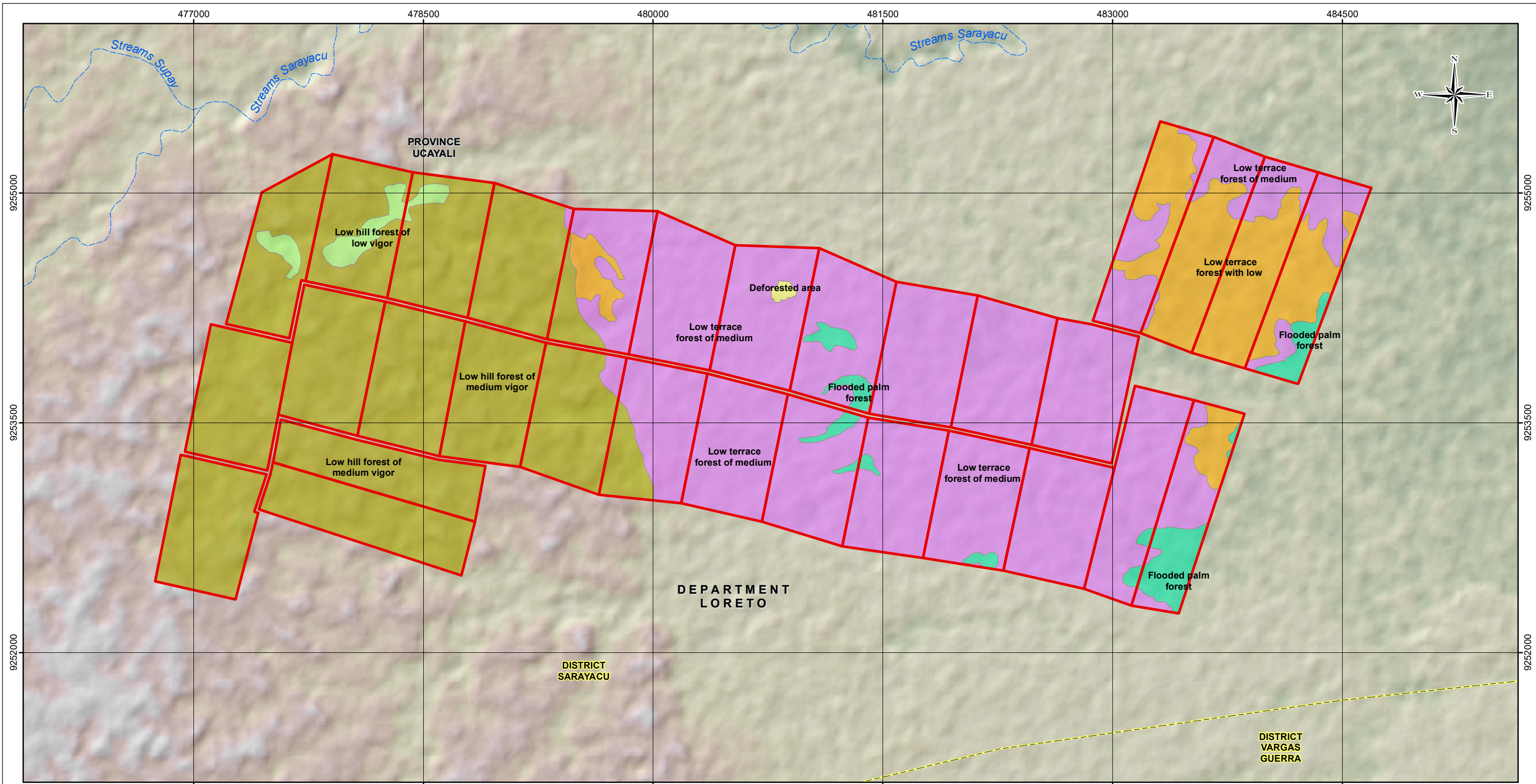
4.0 Current condition of the study area

4.1 Protected species

4.1.1 Vegetation

Regarding the evaluation of vegetation, vegetal formation of hill forest presents, among the most representative species, *Astrocaryum murumuru*, *Phytelephas macrocarpa*, while Terrace Forest is mostly composed by dicotyledonous species with little abundance of palm trees (*Attalea tessmannii*). Likewise, species with greater representation in the hill forest are woody species like *Iryanthera laevis* and *Virola calophylla*. **Map 3.** Vegetal Cover of the Area of Interest.

A clear indicator of an adequate conservation status is having registered individuals of great stand with a shaft diameter greater than 60 cm during field work and also emerging trees higher than 30m. This would indicate that, in case of timber extraction, this has been performed selectively and it has not caused a forest depredation nor "gaps". Besides, the forest presented three levels: understory, subcanopy and emergent.



SYMBOLY

	Streams
	Limit Department
	Limit Province
	Limit District
	Area of Interest

UNITS OF VEGETATION

	Deforested area
	Low hill forest of low vigor
	Low hill forest of medium vigor
	Low terrace forest with low
	Low terrace forest of medium
	Flooded palm forest

Environmental Due Diligence report (DD) for the area of interest (AI) of Fund The Planet

TITLE:

UNITS OF VEGETATION

Scale 1:25,000

 Projection: UTM; Datum: WGS 84; Zone: 18 South

CLIENTE:
FUND THE PLANET

ELABORATED BY: 	PROJECT: PRY-C-21001	DATE: SEPTEMBER 2021	MAP: 03	SHEET: 01
---------------------------	--------------------------------	--------------------------------	-------------------	---------------------

SOURCE: INEI (National Institute of Statistics and Informatics), IGN (National Geographic Institute), MTC (Ministry of Transport and Communications).

About species with timber interest, a total of 13 species were reported. It was also registered that activities of forestry utilization have already been performed since tree stumps (felled trees), trees with plates and signals of the Agency for Supervision of Forest Resources and Wildlife (OSINFOR) were reported, thus it is deduced that the area could have had permission for timber utilization in the past.

Among the trees of major stand in the area of study, the tree known as “Iupuna” *Chorisia integrifolia* with a total height of 18m and a shaft diameter of 66 cm was reported. Individuals of “Iupuna colorada” *Cavanillesia umbellata* with an approximate height of 35m and more than 100cm shaft diameter were reported. These species possess the “Almost Endangered” category by the Peruvian State.

Regarding carbon storage, a storage of approximately 236 tC/ha in low-hill forests is projected with the previously-described formula, while the terrace forest shows a storage of 106 tC/ha. These values are above the estimate by MINAM (2014) for “Accessible Highland Rainforest” 78.84 tC/ha and “Highland Rainforest with Difficult Access” 113.65 tC/ha ecozones.

4.2 Fauna

Birds

Although field work consisted of a rapid visit, a total of 109 bird species (92 species in the low-hill forest and 80 species in the low-terrace forest) were reported. It's important to say, that 63 bird species were reported in both low-hill forest and low-terrace forest. This high richness can be considered an indicator of a good conservation status in the area of study.

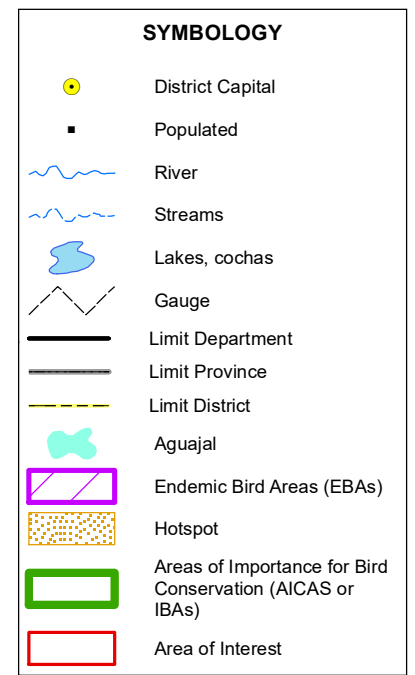
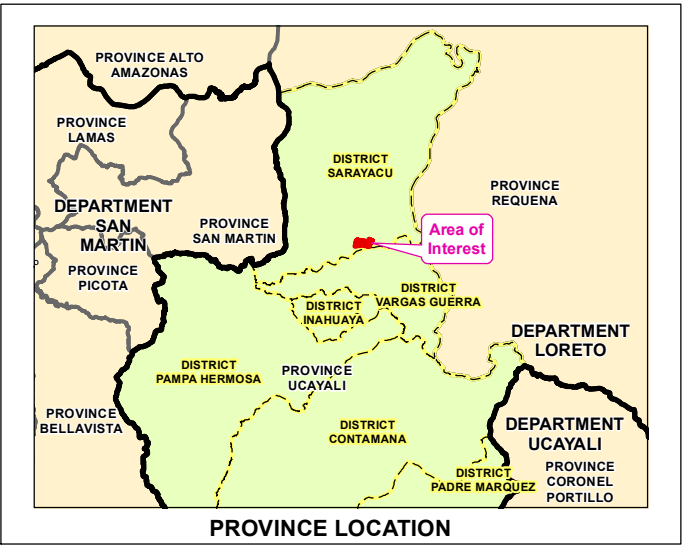
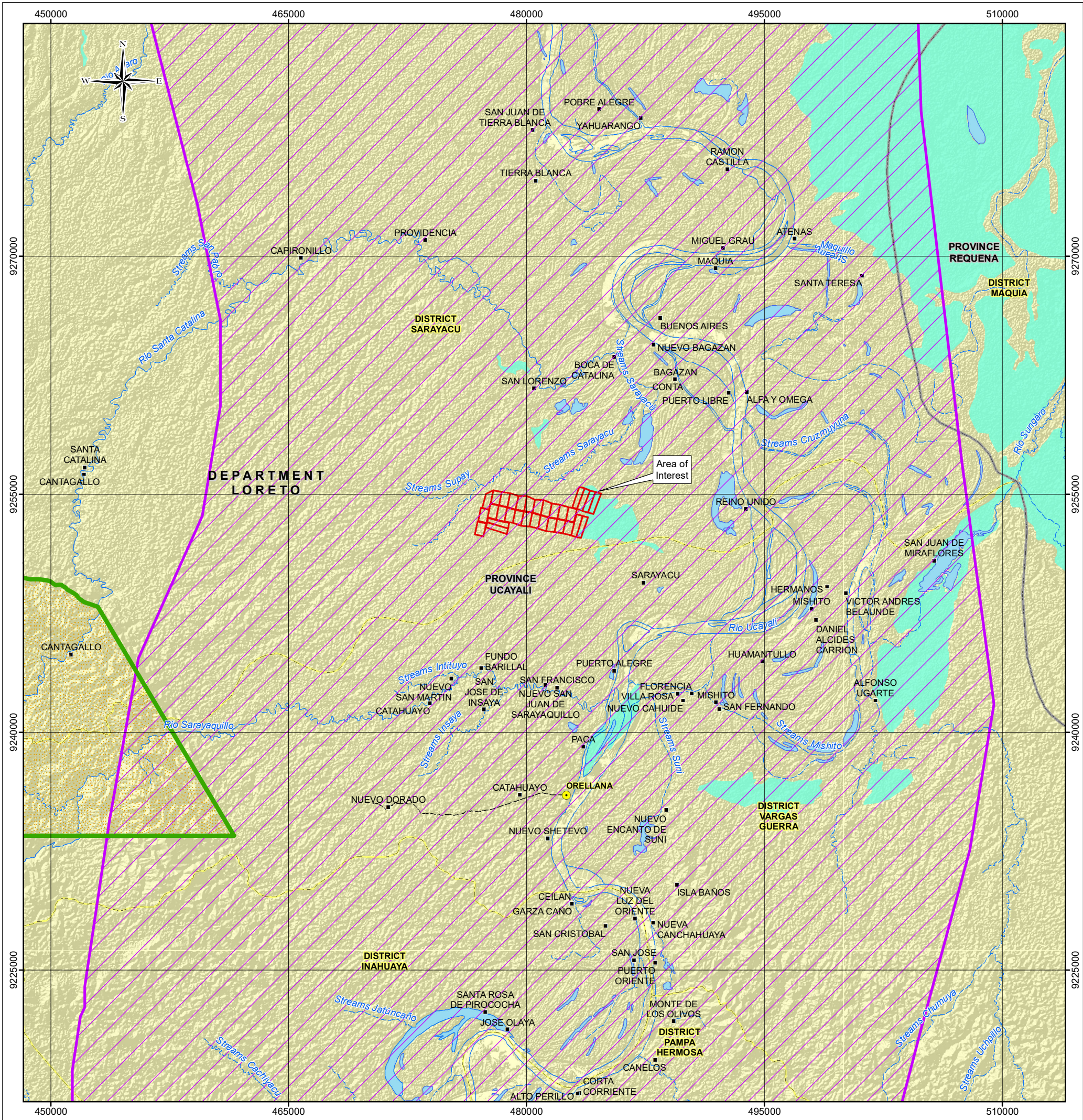
Within the list of protected fauna species by Peruvian legislation, the Critically Endangered (CR) category is the most concerning. In this category, there was only one potentially present species in the area of study: *Crax globulosa* “wattled curassow”. This bird species is listed as endangered (EN) and with a decreasing population trend according to the IUCN (2021). **Map 4.** Endemic Bird Areas

The IUCN (2021) considers it Endangered as it has a very small population which is estimated to have undergone a very rapid population decline. Hunting is suspected to be causing these ongoing declines, and effective control is urgently required. Less than 300 individuals are estimated to be left in Peru. Its geographic range includes the study area (all vegetation units). Yahuarcani et al. (2009) found it in lower río Ucayali close to the confluence with the Marañón.

Amazona festiva “Festive Parrot” and *Ara macao* “Scarlet Macaw” species both considered as “Near Threatened” by the Peruvian State were reported, and they are considered in Appendix II and I of CITES, respectively.

Mammals

A total of two sampling stations with a 2-kilometer circuit each was evaluated, one in each vegetal formation. The *Panthera onca* “Jaguar” species was reported by indirect registers by the registration of a “rascadero” and *Tapirus terrestris* “tapir”. Both species are considered “Near Threatened” by Peruvian legislation, and “Near Threatened” and “Vulnerable” according to IUCN Red List. Tapir is hunted for feeding purposes, and jaguar is hunted for its skin and teeth.



Environmental Due Diligence report (DD) for the area of interest (AI) of Fund The Planet

TITLE:

ENDEMIC BIRD AREAS

Escala 1:250,000		CLIENTE:	
0 2.5 5 10 15 20 Km		FUND THE PLANET	
Projection: UTM; Datum: WGS 84; Zone: 18 South			
ELABORATED BY:	PROJECT:	DATE:	MAP:
	PRY-C-21001	SEPTEMBER 2021	04
SHEET:		01	
SOURCE: INEI (National Institute of Statistics and Informatics), IGN (National Geographic Institute), MTC (Ministry of Transport and Communications).			

Besides, there was a three-primate sighting: “howler monkey” *Alouatta seniculus* considered “Vulnerable” by Peruvian Legislation, “pichico” *Leontocebus illigeri* considered “Near Threatened” by UICN, and Amazonian endemic “squirrel monkey”. It is known that the last two species can be captured as pets.

Mammals' register tends to demand a greater sampling effort due to the group’s high mobility. However, according to CIMA (2014) expeditions, more than 90 species of mammals can be found, such as bats, primates, anteaters, spectacled bears, among others.

Amphibians and reptiles

A total of 2 sampling stations with 3 200-meter-long transects each were evaluated. This makes a total of six transects evaluated in the whole area, where three corresponded to low-hill forest and three for low-terrace forest.

A total of 29 species were reported, 16 corresponding to amphibians and 13 to reptiles. The Amazonian endemic *Chelonoidis denticulatus* “yellow-footed tortoise” species or also known locally as “Motelo” was reported. This species is hunted as food. This species is in Appendix II of CITES and it is considered as “Vulnerable” by IUCN. Other species hunted for feeding purposes and reported in the field work is the amphibian *Leptodactylus pentadactylus*. The Amazonian endemic “gold tegu” *Tupinambis teguixin* was also reported, and it is considered in Appendix II of CITES.

Sensitive Biological Areas (ABS)

A total of two ABS was identified: trough and water trough in an approximate area between 2 and 5m², all located in the low-hill forest. Hereafter, pictures of the reported Sensitive Biological Areas are shown:



Picture 1: Sensitive Biological Area (ABS): “drinking trough”



Picture 2: Sensitive Biological Area (ABS): “drinking trough”



Picture 3: Sensitive Biological Area (ABS): “trough”

4.3 Endemism

4.3.1 Vegetation

Many of the reported and potential species are endemic at least for the Amazon region, such as *Dipteryx micrantha* “Shihuahuaco”. Used as logging and wood harvesting. According to IUCN Red List (2021-2), conservation actions are needed such as species management, legislation, polices and regulations. Population is unknown but it is decreasing. Further studies are recommended, specially to forestry type of vegetation.

4.3.2 Fauna

Many of the reported and potential species are endemic at least for the Amazon region, such as the birds *Ara macao* “Guacamayo Escarlata”, *Amazona amazonica* “Loro de Ala Naranja” and others.

In mammals, the *Leontocebus illigeri* Illiger’s Saddle-back Tamarin reported during fieldwork, is endemic of Peru. Acoording to IUCN (2021-3) it’s distribution only includes the Loreto and Ucayali regions.

The amphibian *Noblella myrmecoides* is located only the Peruvian Amazon reported in fieldwork. Also, the potential species *Ranitomeya benedicta* is endemic of Ucayali and Loreto regions in Peru.

4.4 Socioeconomic importance

4.4.1 Vegetation

Most of potential species and reported in fieldwork has a potential socioeconomic use and importance. Most of them are used in woodwork, furniture, floors, matches and others. Such as: *Guatteria elata*, *Chorisia integrifolia*, *Tabebuia* sp.

4.4.2 Fauna

On the other hand, fauna is mostly used in hunting activities for feeding purposes. In this case, big mammals such as *Tapirus terrestris* are hunted. Also, some amphibians like *Leptodactylus pentadactylus* and tortoise like *Chelonoidis denticulatus* for feeding or by their skin.

4.5 Bird-specific Criteria

The area of interest is located inside the EBA Upper Amazon-Napo lowlands. The upper Amazon-Napo lowlands cover a vast area of eastern Ecuador (Napo and Pastaza Amazonas state of Brazil and the southern border area of Colombia). The area is centered on the lowland and foothill forests of the upper Putumayo river, the middle and upper Napo, the Marañon (including the Pastaza and Huallaga rivers), the Ucayali (and possibly the Javari), and the Amazonas drainages, generally west of the confluence of the Putumayo states), northern Peru (Amazonas, Loreto and San Martín departments), westernmost and Amazonas, and primarily from the lowlands up to 600 m.

The area is characterized by high rainfall (which is relatively constant year-round), complex topography and soils, and vast meandering river systems that create habitat mosaics. This ecosystem is extraordinarily diverse and comprises primary humid forest, some of which is seasonally inundated (várzea) forest, with other areas more characteristic of nutrient-poor white-sand forest.

4.6 Exclusive Criteria for forestry resources

Secondary information and fieldwork showed that the forest and vegetation has more than 90% of vegetal cover, including 100% of vegetal cover in some areas. Also, that many of forestry individuals had more than 80cm of shank diameter. The score of the Conservation status in the area of study is shown in **table 15**.

4.7 Conservation Status

With the information gathered added to the fieldwork, it can be assumed that the type of vegetation within the study area possess a high level of conservation.

The vegetation unit “low-hill forests” registered a high conservation status with 170 points and the vegetation unit “low-terrace forests” registered also a high conservation status with 165 points.

The presence of BSAs made the main scoring difference between both vegetation units.

Table 15. Conservation Status in the Area of Study by Vegetation Unit

Vegetation Unit	Protected Species				Endemism				Socioeconomic Importance				Exclusive Criteria for Birds			Exclusive Criteria for forestry resources			Biologically Sensitive Areas (BSAs)	Score by Group					Total Score	
	Birds	Mammals	Herpetology	Vegetation	Birds	Mammals	Herpetology	Vegetation	Birds	Mammals	Herpetology	Vegetation	Migratory	Ramsar**	EBAS****	CMS***	tC/ha Projection	Vegetal Cover Percentage		Presence of Forestry	Birds	Mammals	Herpetology	Vegetation		Forestry Resources
Low-hill Forests	20	20	20	5	5	7.5	7.5	3	3	8	3	8	0	0	5	0	20	15	20	5	30	35	30	15	55	170
Low-terrace Forests	20	20	20	5	5	7.5	7.5	3	3	8	3	8	0	0	5	0	15	20	20	0	30	35	30	15	55	165

Source: ASD, 2021

4.8 Social Actors and Communities

Parcels are not in the peasant (CP) and indigenous communities (CN). The closest communities to the parcels are CN Nuevo Shetevo and Nuevo Encanto de Suni, approximately 15 km away as it is shown in Figure 7. **Map 5.** Communities and populated centers near the area of interest

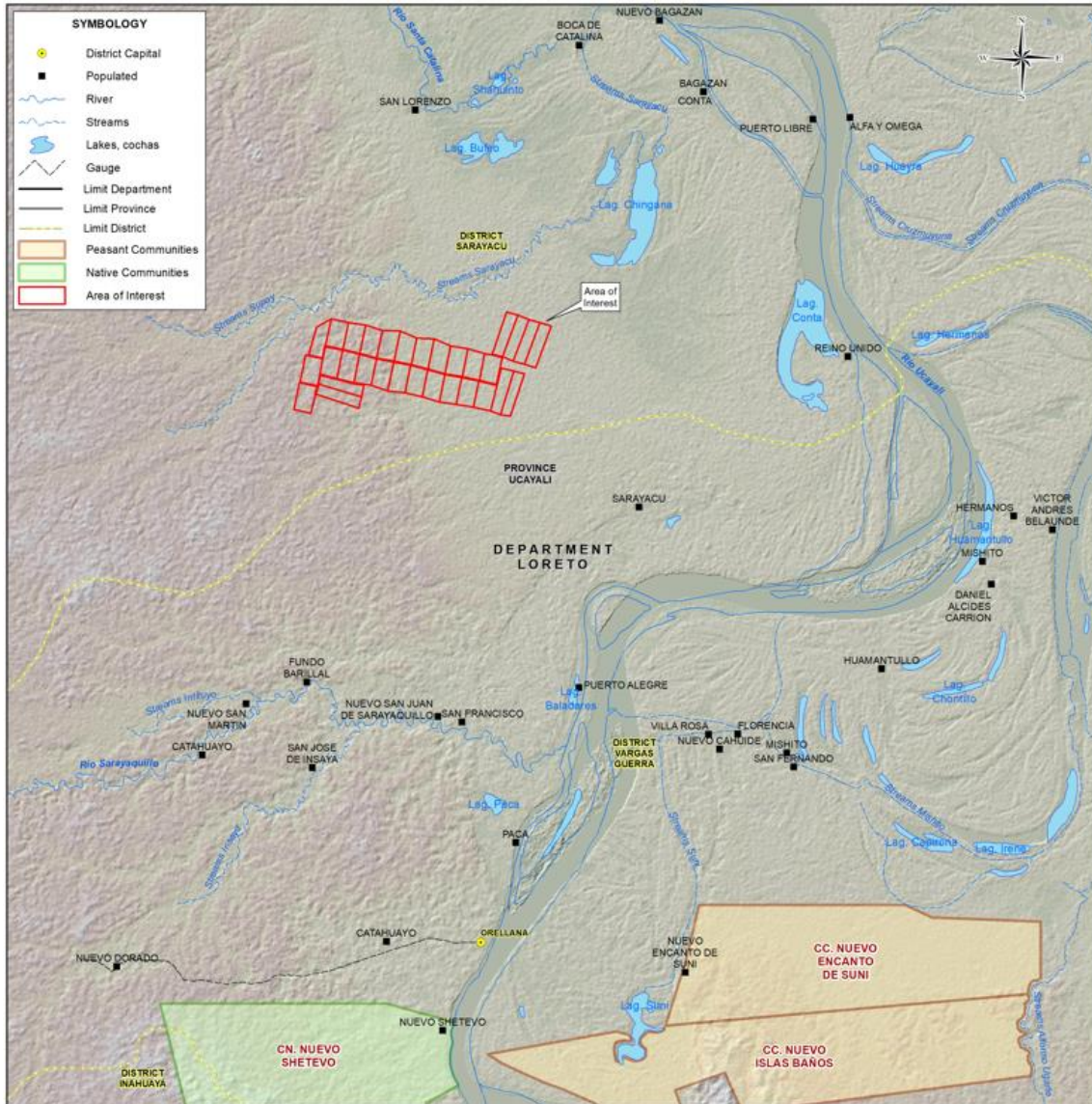
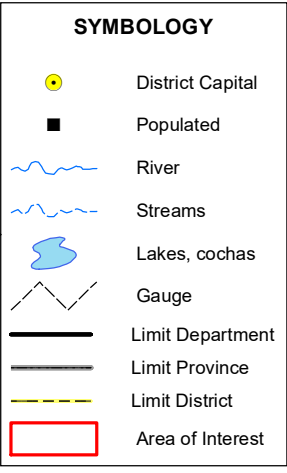
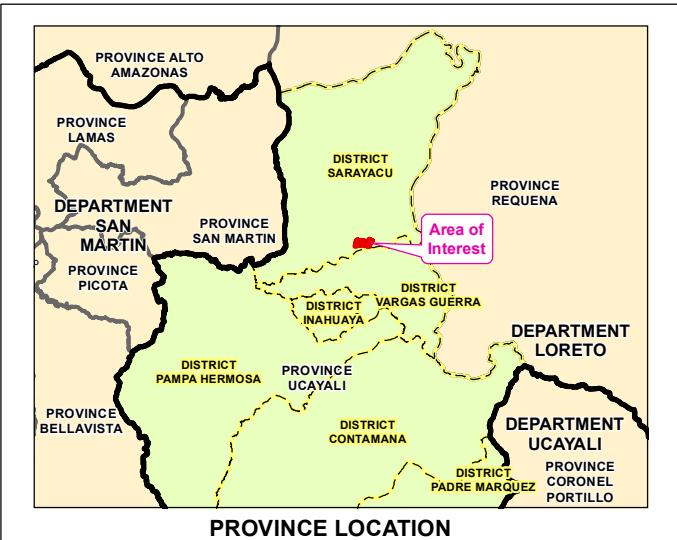
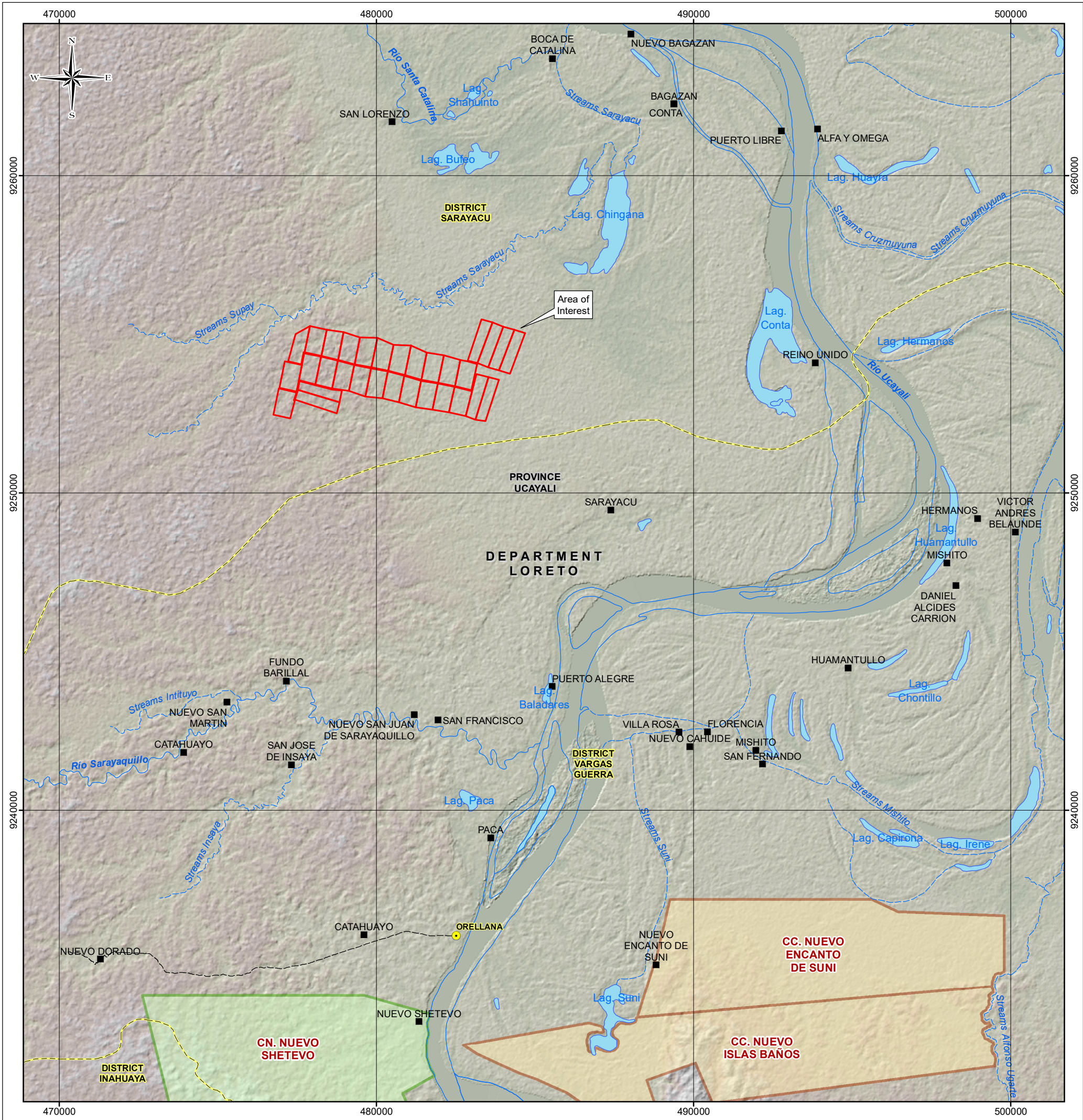


Figure 7. Indigenous and Peasant Communities

Due to the proximity and existing accesses from Orellana and Sarayacu population centers to the area of interest, they could have a greater influence on the parcel's existing resources since their inhabitants perform activities like agriculture, hunting, and timber extraction in areas close to the parcels.

In that sense, we present information about the most relevant social and economical aspects in the two populated centers. This information was collected through interviews with inhabitants and local authorities on August 23th and 24th in Orellana, and August 24th in Sarayacu.



Environmental Due Diligence report (DD) for the area of interest (AI) of Fund The Planet

TITLE:
COMMUNITIES AND POPULATED CENTERS NEAR THE AREA OF INTEREST

<p>Escala 1:125,000</p> <p>Projection: UTM; Datum: WGS 84; Zone: 18 South</p>	<p>CLIENTE: FUND THE PLANET</p>			
<p>ELABORATED BY: </p>	<p>PROJECT: PRY-C-21001</p>	<p>DATE: SEPTEMBER 2021</p>	<p>MAP: 05</p>	<p>SHEET: 01</p>

SOURCE: INEI (National Institute of Statistics and Informatics), IGN (National Geographic Institute), MTC (Ministry of Transport and Communications).

Orellana Populated Center

It has one (01) public health center with 1 doctor, 1 obstetrician and 3 nurse practitioners. Regards to Education, it has 02 kindergartens, 02 elementary schools, and 01 high school. It does not have any higher education institution.

The main economic activities performed by the population are agriculture and timber extraction of the following species: shihuahuaco, lupuna, estoraque, ishpingo, diesel tree, tahuari, bolaina, cedar and quinilla. Likewise, they hunt animals like lowland tapir, collared peccary, huangana, deer, lowland paca, opossum, añuje, capybara, curassow, pucacunga, turkey hen, partridge, among others. Hunting areas are generally located by the Sarayaquillo River, Catalina Gorge, San Martin highway, Baños Island, and Suni, among other places.

Timber extraction is performed in different sectors like San Martin highway. Thirty percent is used to build their houses and 70% is for sale. Regarding land cleared for “shifting” agriculture, these areas are used for two (02) years and then they are left to rest, and then they are used again at the fourth or fifth year or in some cases they are abandoned with a barely production or no production at all. In average, 2.0 ha of forests can be intervened annually for each family dedicated to agriculture.

“Shifting” agriculture, also known as “slash-and-burn”, consists of tearing down the forest, burn the unused wood, farm, and abandon the place when the soil’s fertility does not allow crops development, which happens 2 or 3 years after, in average. Forest regeneration can return certain fertility to the soil by different physical-chemical mechanisms, allowing that after a period between 5 and more than 20 years they can go back to farm the same place. That period, in general, is known as “rest” (Durojeanni, 2013).

SERNANP and NGO CIMA are present in the populated center Orellana through their staff since they can move from this location to perform surveillance in Cordillera Azul National Park and its Buffer Zone (east-side of the ANP), and besides they can coordinate training activities to strengthen conservation plans for the ANP and its BZ.

Sarayacu Populated Center

Sarayacu Population consists of about 2000 inhabitants. Most of the population is mestizo or settler. They have a health center where there is only one nurse.

Regarding education, it has one kindergarten with 70 students and one school for elementary and high school with 248 students. There are 09 teachers in total.

In Sarayacu there is no presence of NGO nor SERNANP; however, they manifested that they receive support from the State through alternative development projects that are aimed for cacao, corn and banana plantation. The land cleared for agriculture is used for 2 years and they come back to use it again at the fourth or fifth year. Each family dedicated to agriculture can intervene an average of 2.0 ha per year.

Likewise, population performs timber extraction of the following species: guanandi, moena, capirona, among other species that are found in areas close to the area of interest. In average, 50% of the timber extraction is used to build their houses and 50% is used for sale.

Population in general hunts animals by the Sarayaquillo River, Catalina Gorge, San Martin highway, and also Baños and Suni Islands. **Map 6.** Hunting Areas

It is important to highlight that coca leaf is planted in areas close to the Sarayacu populated center and it expands to parcels close to the area of interest. According to the Integrated System for Illicit Crop Monitoring (SIMCI), since 2014 to 2016, illegal coca cultivation was focused 12 km northern Orellana City, in Vargas Guerra District (Ucayali province, Loreto Region).

The growth of areas for coca crops in our Amazonia is of 14% annually, according to the last analysis in 2017. Forest loss in Peru is about 2.3 millions of ha due to this reason. The estimate was done for the last 5 decades according to the National Commission for Development and Life without Drugs (DEVIDA).

5.0 Current Soil Use

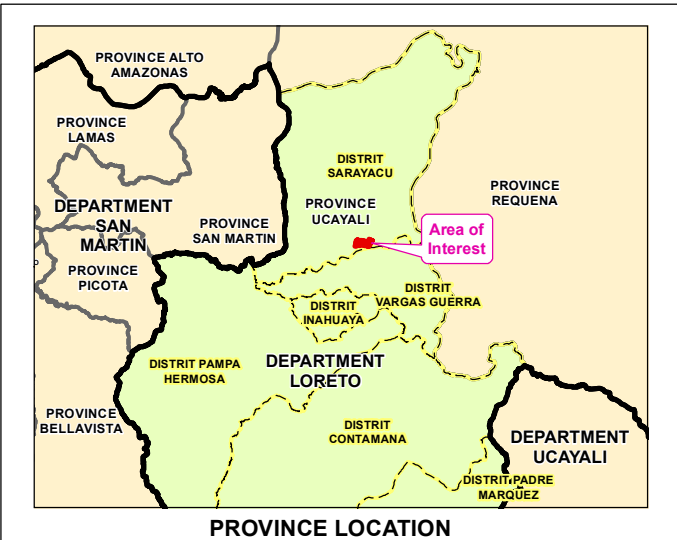
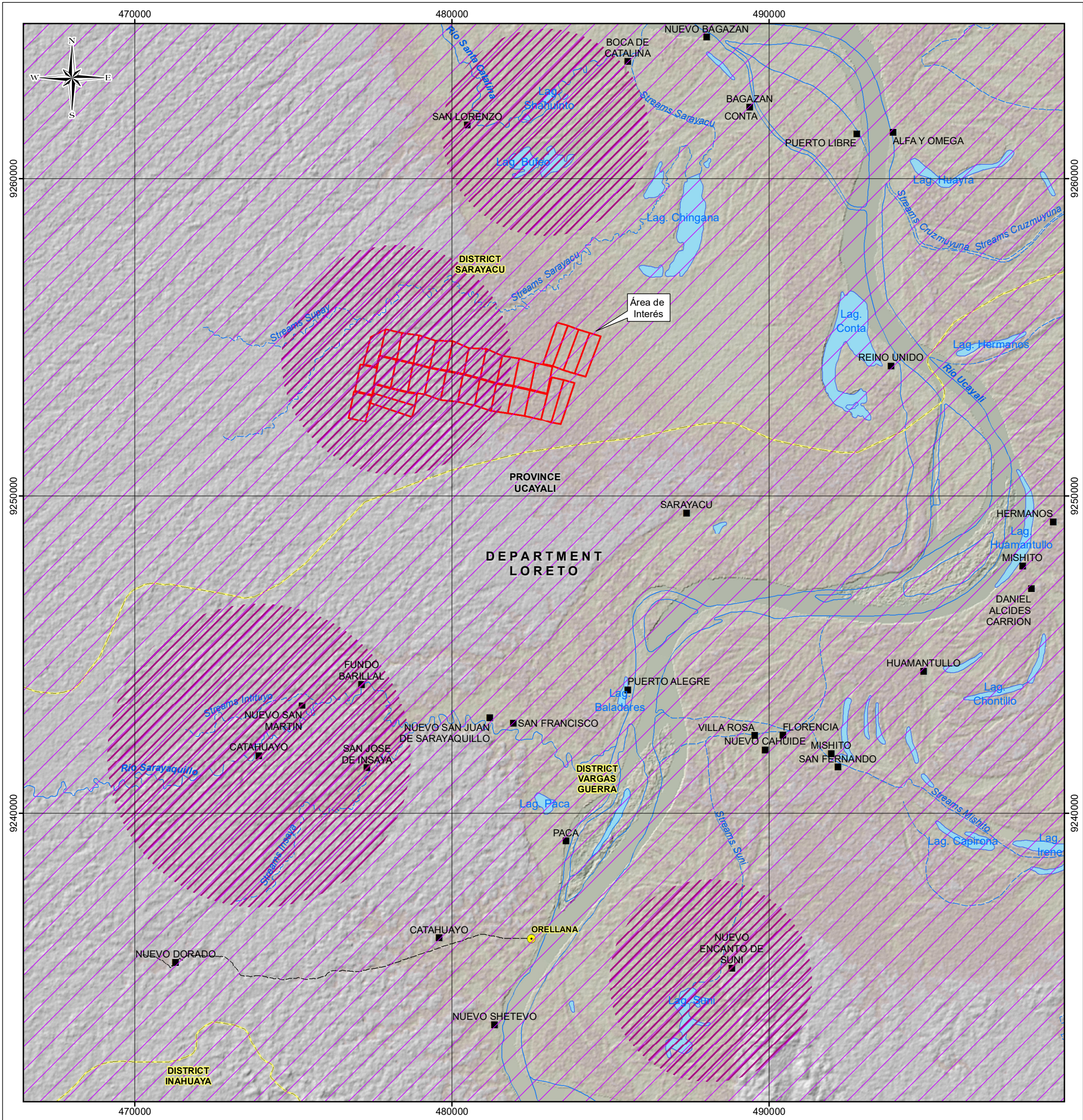
Most part of the area of interest is inside the following vegetation units: low-hill forest of low vigor, low-hill of low vigor, low-terrace forest of low vigor, low-terrace forest of medium vigor, low-terrace forest of low vigor, flooded swamp forest, and deforested area.

Table 16. Current soil use of the interest area

Type of Forest	ha	%
Deforested Area	1.59	0.11
Low-Hill Forest of low vigor	16.49	1.13
Low-Hill Forest of medium vigor	559.07	38.40
Low-Terrace Forest of low vigor	145.10	9.96
Low-Terrace Forest of medium vigor	694.82	47.72
Flooded Swamp Forest	38.99	2.68
Total	1456.06	100.00

Source: ASD, 2021, Imagen Satelital's Interpretation

It is noted that the interest area does not register forest concessions, mining concessions, hydrocarbon concessions nor archeological sites as it is shown in **Map 7.** Concessions, Rural Properties, and Archeological Sites.



SYMBOLY

- District Capital
- Populated
- ~ River
- ~ Streams
- ☾ Lakes, cochas
- Gauge
- Limit Department
- Limit Province
- Limit District
- ▭ Area of Interest

LEGEND

- ▨ Hunting Areas

Environmental Due Diligence report (DD) for the area of interest (AI) of Fund The Planet

TITLE:

HUNTING AREAS

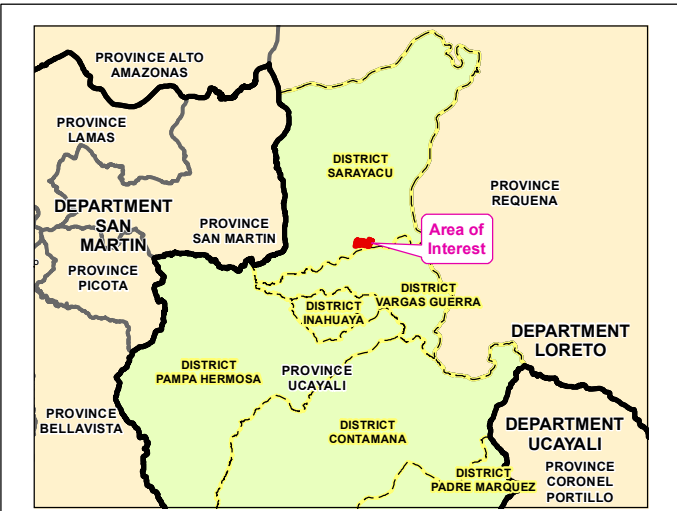
Scale 1:125,000
 0 1 2 4 6 8 10 Km

Projection: UTM; Datum: WGS 84; Zone: 18 South

CLIENTE:
FUND THE PLANET

ELABORATED BY: ASD	PROJECT: PRY-C-21001	DATE: SEPTEMBER 2021	MAP: 06
			SHEET: 01

SOURCE: INEI (National Institute of Statistics and Informatics), IGN (National Geographic Institute), MTC (Ministry of Transport and Communications).



Environmental Due Diligence report (DD) for the area of interest (AI) of Fund The Planet

TITLE:
CONCESSIONS, RURAL PROPERTIES AND ARCHEOLOGICAL SITES

0 2 4 8 12 16 Km
 Escala 1:200,000
 Projection: UTM; Datum: WGS 84; Zone: 18 South

CLIENTE:
FUND THE PLANET

ELABORATED BY: ASD	PROJECT: PRY-C-21001	DATE: SEPTEMBER 2021	MAP: 07	SHEET: 01
------------------------------	--------------------------------	--------------------------------	-------------------	---------------------

SOURCE: INEI (National Institute of Statistics and Informatics), IGN (National Geographic Institute), MTC (Ministry of Transport and Communications).

6.0 Potential Carbon Sequestration

Carbon Storage and Sequestration in Trees

The performed analysis determined that the carbon content (storage) in low-hill forests was estimated to be **236 TC/ha**, while the terrace forest presents a storage of **106 TC/ha**. This is the carbon that is already in trees (shafts and branches)⁶. These values are similar to the ones estimated in plots inside Allpahuayo Mishana National Reserve and other plots monitored by RAINFOR network, located in Napo River basin, in Loreto Region (Del Águila et al 2014, ForestPlot.Net).

Furthermore, according to the Research Institute of the Peruvian Amazon (2018), the primary intact forests of the Peruvian Amazon act as a carbon sink: a key ecosystem service of international importance. This sink has been quantified as 0.52 TC/ha per year (1990-2017) for the intact Amazonian forest in the protected areas and associated buffer zones of Peru.

Carbon Storage and Sequestration in Soil

Alegre et al (2002) determined the carbon in different Land Use Systems (LUS) in the Aguaytia watershed, located in the Ucayali region. For the untouched primary forest SUT, the soil carbon stock⁷ was determined to be **76.80 TC/ha**.

Carbon Storage and Sequestration (trees and soil) in the interest area

The estimated values by hectare are closely related to the level of forests conservation.

Table 17. Carbon stock in the interest area

Carbon pool	Carbon stock	
	Low-hill forests	Terrace forest
Carbon stock in above ground biomass	236.00	106.00
Carbon stock in the soil	76.80	76.80
Total TC/ha	312.80	182.80
Average (TC/Ha)	247.80	
Interest Area (Ha)	1456.06	
Carbon Storage TC	360,796.8	
Total TCO ₂ eq sequestered	1,32304.87	

Source: ASD, 2021

⁶ Information obtained from the field evaluation in the interest area

⁷ Soil depth from 0-40cm, roots from 0 to 20cm



The average carbon content for the two types of vegetation cover is **247.8 TC/ha**. This value was projected for the area of interest. So that the carbon stock estimated for the total area of interest is 360,796.8 TC.

In order to get a molecule of C it is necessary to capture of a molecule of CO₂, only 12 out of the 44 molecular weight belongs to carbon, the coefficient used was $44/12 = 3.667$ TCO₂ (Nowak, et al., 2007) and as result there are TCO₂⁸ that have been sequestered from the atmosphere.

CO₂ sequestered from the atmosphere is **1,323,041.87 TCO₂**
 Carbon Storage (360,796.8) x 3.667 TCO₂= 1,323,041.87 TCO₂

Regarding the potential CO₂ sequestration, this is calculated with the sink and the conversion factor for C to CO₂. As a result, the potential CO₂ sequestration was 1.9 TCO₂/ha per year which would add to the stock of sequestered carbon.

$$\text{Potential CO}_2 \text{ sequestration per hectare per year} = 0.52\text{TC/ha} * \frac{44}{12} = 1.9 \text{TCO}_2/\text{ha}$$

Considering the potential CO₂ sequestration per hectare per year and the total area of interest (1456 ha), the potential CO₂ is calculated, and its result is 2766.5 TCO₂/year in the area of interest.

$$\text{Potential CO}_2 \text{ sequestration in the area} = 1.9 \frac{\text{TCO}_2}{\text{ha}} * 1456 \text{ ha} = 2766.5\text{TCO}_2$$

⁸ 44/12= Conversion factor for C to CO₂

7.0 Environmental and Social Risks

Up next, the main environmental and social risks identified in the area of interest are pointed.

Agricultural Areas and Illegal Crop Expansion

Accelerated expansion in areas for agricultural crops practiced by inhabitants, especially in Sarayacu, represents a threat for forests loss in the area of interest. Non-traditional, small-scale swidden agriculture, among other factors, and non-sustainable forestry extraction are closely related to the soil and forest resources use and management patterns in production activities performed by populations settled there (**Figure 8**). Furthermore, in the **Figure 9** show the growth of growing areas during the last twenty years in Sarayacu.

Likewise, presence of illegal coca crops has been registered in the area of interest and its surroundings. Inhabitants seek to plant that crop in areas with low vegetal cover far from areas with major accessibility not to be easily identified. This activity has an annual increase of 14% according to the last analysis in 2017. It is assured that its growth is related to the increase on demand of its derivatives or its confiscation. Forest loss in Peru due to that reason is approximately 2.3 million of ha. The estimate was done for the last 5 decades according to the National Commission for Development and Life without Drugs (DEVIDA). According to SERNANP, there is an increase of illegal crops in the BZ and the PNCAZ around Orellana sectors (Nuevo Dorado and Santa Catalina Surveillance and Controlling Sectors). The main actors that implement illicit crops are migrants, illegal possessors, among others. Insecurity effects of the area are summed up to this and it makes any conservation activity intended to be developed vulnerable.

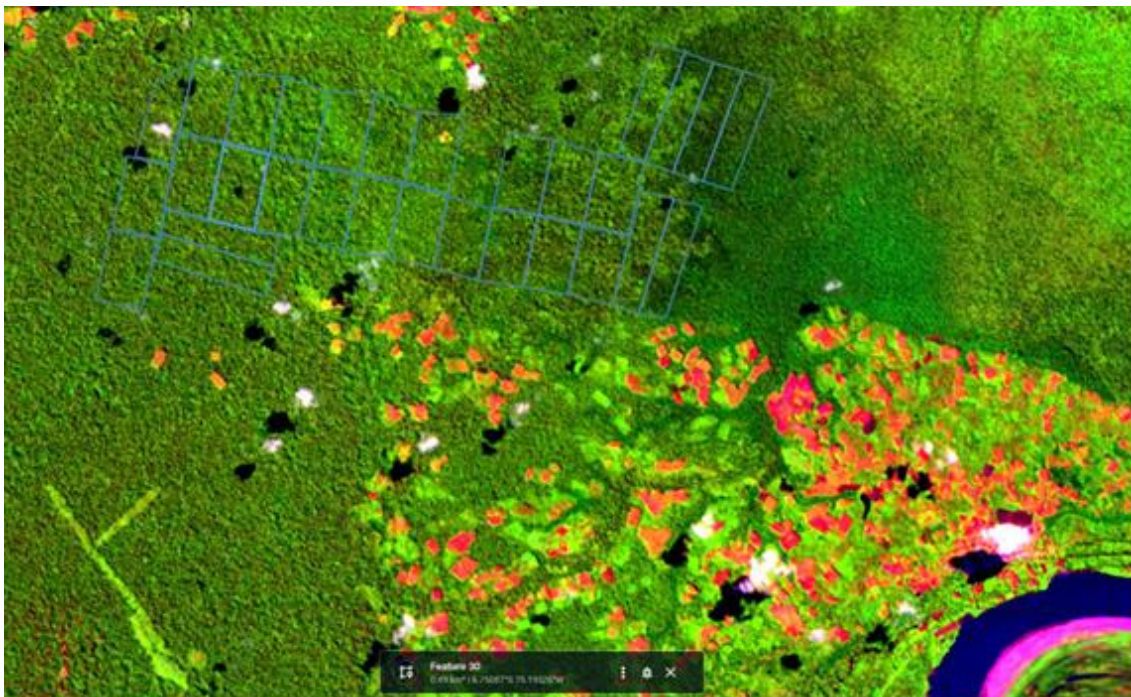
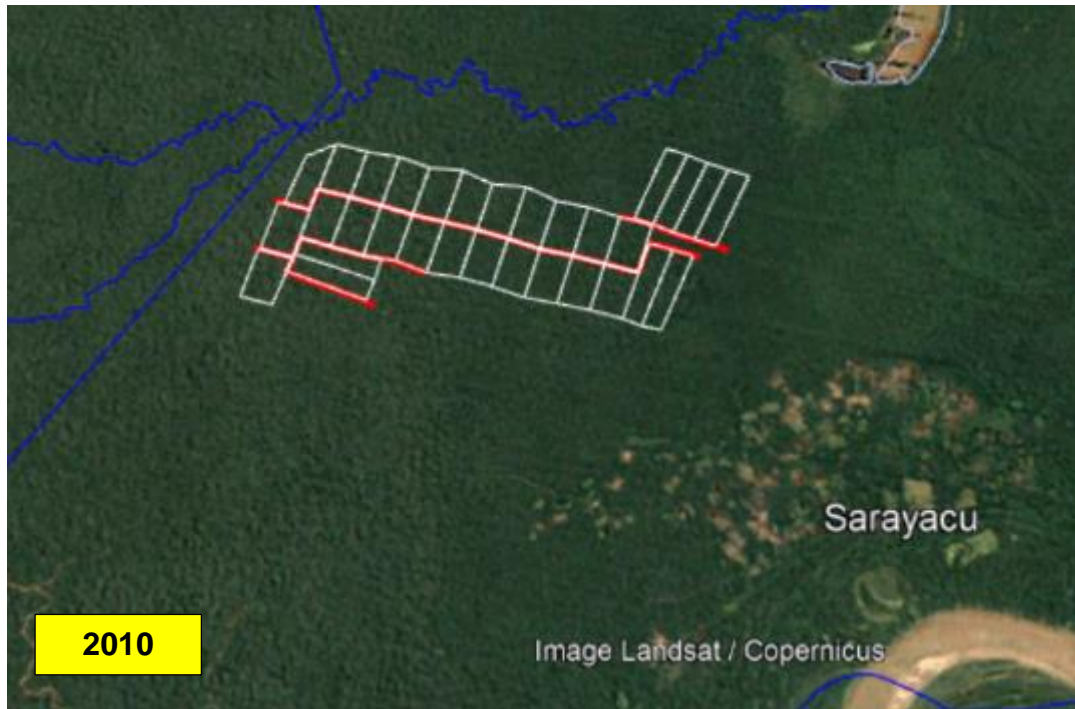


Figure 8. Vegetal Cover Registered by Sensor

Source: Land viewer, august 2021







Source: Land viewer, august 2021

Figure 9. Growth of growing areas 2000-2020

Illegal Logging in the Area of Interest

The opening of new carriageways towards the area of interest -from the existing accesses in Orellana and Sarayacu- may result in illegal timber logging. This could be mainly extracted with heavy machinery.

It is important to highlight that a 13-km-logging trail, and after that an approximate 6-km trail, by which no vehicle or heavy machinery can circulate, that need to be accessed to go from the Orellana Populated Center to the area of interest. In 2017, the owner of the parcels of the area of interest opened a logging trail from the Sarayacu Populated Center; however, that trail is not operative and it is observed that the intervened area is in process of vegetal cover recovery. In addition to this, ships with the capacity to transport timber cannot navigate in most present gorges close to the area of interest and it makes it considerably difficult to have a massive forest extraction.

However, according to SERNANP, the main actors that generate openings of logging trails in the BZ of PNCAZ are the invading migrants and illegal possessors. More than 500 km of opened roads have been registered in the last 5 years in the BZ of PNCAZ in San Martín, Loreto and Huanuco Region. This is a serious problem for the old-growth forest conservation interests.

Figure 10 shows an access that is located close to the area of interest. **Figure 11** shows an access that is in the area of interest, which goes from South to North. The figures were registered during the field work.



Figure 10. Logging Trail. Opening from Sarayacu to the Area of Interest.

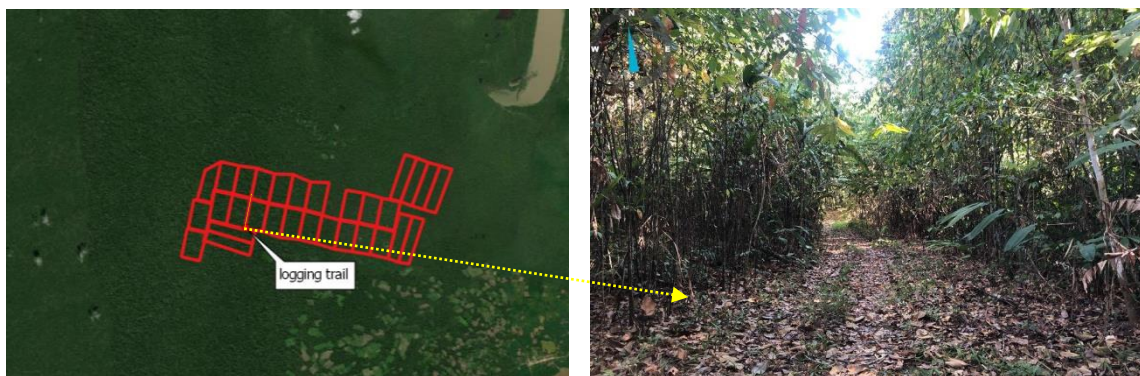


Figure 11. Logging Trail. Opening from the path to the north of the Area of Interest.

Habitat loss and habitat Fragmentation

The opening of logging trails facilitates accessibility and increases the risk of occurrence of habitat loss and fragmentation. The fragmentation is the division process of a continuous habitat in sections. Resulting fragments are different from the original habitat by being smaller.

Risk of Conflict with Local Population

Local population dedicated to agriculture activities, illegal timber extraction, and coca crops production could oppose to the presence of a non-local proprietary and to the fact that the parcels will be intended for its conservation as only use, making their entrance to be restricted.

The closure of existing paths or trails to the area of interest can create tension and possible claims and demands to the new owner since activities like agriculture or hunt will not be permitted. The closure can be taken as a mechanism of pressure to obtain attention to the local population demands.

Invasion, Settlement and Illegal Occupation of Land

The main agents that could invade are settler migrants specially coming from the highlands. Inhabitants that built up peoples are mostly migrants whose main activity is cacao, coffee, fruits, rice crops, subsistence farming and farming.

Indiscriminate Hunting as Indirect Consequence

In many cases, inhabitants or land possessors do not have titles or clearly defined lands. This condition could generate conflicts between local population and the company.

In other cases, there is an informal and illegal use of forest products in the rainforest of Loreto and Ucayali, which has increased considerably even in concession areas where concession holders have lost control over them.

8.0 Conclusions

- The area of interest is completely located in the BZ of PNCAZ, it does not overlay lands of indigenous communities, forest, mining and/or hydrocarbon concessions.
- The forest in the area of study is in a high conservation level with vegetation cover above 80%, and with presence of emergent timber trees (≥ 30 m high)
- Flora and Fauna records show that the area of interest has a high richness level (number of species), also many reported species are included in the protection lists of the UICN data and Peruvian legislation.
- Orellana and Sarayacu population express that they perform hunting activities in the area of interest and in places close to it.
- CO₂ sequestered from the atmosphere is 1,323,041.87 TCO₂, The Carbon Storage for the interest area is 360,796.8 TC. The carbon content in trees (shafts and branches) and soil is of 312.80 T C/ha in low-hill forests and 182.8 T C/ha in low-terrace forests. It is similar to other Amazonian forests that are under protection-modes, such as ANPs.
- The main threat in the area of interest is deforestation due to crop production expansion (including illegal coca crops), and illegal logging of forest resources performed in surrounding zones. This type of forest intervention could generate habitat fragmentation and it could slowly reduce the forest's environmental resources and services.
- No operative logging accesses are registered in evaluation zones prioritized for the area of interest (it is unknown if the logging access in figure 10 is currently used by vehicles or just pedestrians). The one enabled in 2017 for timber extraction can be seen in satellite images. It is also seen the intervened area is in recovery process and it should be supervised throughout its length to avoid for getting it opened again, allowing forest resources extraction of the area of interest.
- Keeping the area of interest without population intervention (activities like agriculture, hunting, timber extraction) in areas close to the parcels in long term will require a constant supervision, alliance with local and regional institutions, besides of sensibilization in populated centers.

9.0 Recommendations

- It is important to recognize that all prediction of biodiversity response to perturbation is uncertain, especially over long-time frames. In this case, is important to apply a monitoring program. In many projects in Peru, it's known as a good environmental practice to do participatory monitoring as a way of good relationship with the communities. During fieldwork, local assistants showed special interest to learn and work with the specialists. This is a great potential to create such a program of annual flora and fauna monitoring.
- Establish work alliances and collaboration with the Center for Research, Conservation and Management of Natural Areas (CIMA) for it to include the area of interest's parcels in its supervision, awareness, and research programs.
- Place a wire fence and signs (private property) in sectors of the area of interest where agricultural and timber extraction activities have been detected so inhabitants can recognize the parcel's limits.
- If convenient, perform corresponding management actions before SERNANP so the area of interest can be recognized by the State as a Private Conservation Area (ACP), which will contribute to the threatened species protection, and to an exclusive space for scientific research.
- The area of interest shows high potential for REDD projects that are currently being implemented in PNAZ and its BZ, and also in the ACP that has been established. The purpose of this climate change mitigation mechanism is to reduce Greenhouse Gases produced by soil use, change of soil use, and silviculture (use of forests).
- Involve Orellana and Sarayacu population in fauna and flora monitoring activities, as well as surveillance and conservation activities, which will contribute to the population awareness and forest conservation.
- Perform a route in the area of interest in order to identify and to close opened accesses that can specially facilitate timber extraction.
- Establish a network of permanent forest plots in different sectors of the area of interest for carbon monitoring. The network of permanent plots will generate data about the carbon balance (sink and stock).
- Evaluate feasibility of performing gradual forestation activities along with Sarayacu population (that plant crops in areas close to the area of interest) in order to recuperate intervened areas and reduce agricultural expansion towards the area of interest.
- In future evaluations of conservation level, it is recommended to include additional criteria such as: keystone species, indicator species, and umbrella species. We also recommend three additional bird species-exclusive criteria: highly sensitive, high research and conservation priority according to Stotz et al (1996). and two mammal species-exclusive: differentiated importance within the range of movement and the existence of genetically distinguishable populations.

10.0 Bibliography

CITES (2021). Apéndices I, II Y III de la Convención sobre el Comercio Internacional de Especies Amenazadas de Fauna y Flora Silvestres.

CMS (2020) Convention on the Conservation of Migratory Species of Wild Animals.

Eberhardt, L.L. (1976) Quantitative ecology and impact assessment. *Journal of Environmental Management* 4, 27-70.

BirdLife International (2021) Country profile: Peru. Available from <http://www.birdlife.org/datazone/country/peru>. Checked: 2021-09-03

El Peruano (newspaper) (2006). Decreto Supremo N° 043-2006-AG. Aprueban categorización de especies amenazadas de flora silvestre. (Supreme Decree No. 043-2006-AG that approves the classification of threatened species of wild flora)

El Peruano (newspaper) (2014) Decreto Supremo N° 004-2014-MINAGRI Aprueban la actualización de la lista de clasificación y categorización de las especies amenazadas de fauna silvestre legalmente protegidas.

Nowak, D.J., Noble, M.H., Sisini, S.M., and Dwyer, J.F. 2001. Peoples & Trees: Assessing the US Urban Forest Resource. *Journal of Forestry*. 99(3): 37-42.

Power, M.E. and Mills, L.S. (1995) The Keystone cops meet in Hil. *Trends in Ecology and Evolution* 10 (5), 182-184.

Ramsar (2021) The Ramsar convention on wetlands. www.ramsar.org

Ratcliffe, D.A. (1977) *A Nature Conservation Review*. Cambridge University Press, Cambridge.

Stotz, D., J. Fitzpatrick, T. Parker III and D. Moskovits. 1996. Neotropical Birds: Ecology and Conservation. University of Chicago Press, Chicago, USA. Thurber, Mark & Valdivieso, Sebastian & Nobao, Gabriel & Silva, Francisco. (2008). Microhabitat Protection during Geophysical Exploration in High Diversity Tropical Rainforest. 10.2118/111536-MS.

Treweek, J. (1999). Ecological Impact Assessment. United Kingdom: Blackwell Science Ltd

IUCN (2021). The IUCN Red List of Threatened Species. Version 2021-1. <<https://www.iucnredlist.org>> ISSN 2307-8235

Yahuarcani, A., Morote, K., Calle, A. y Chujandama, M. 2009. Estado de conservación de *Crax globulosa* en la Reserva Nacional Pacaya Samiria, Loreto. *Revista Peruana de Biología* 15(2): 41-49. (Conservation Status of *Crax globulosa* in Pacaya Samiria National Reserve, Loreto. Peruvian Biology Magazine).

IIAP (2018) The carbon sink in intact Amazonian forests is an opportunity to achieve sustainable conservation

Whittaker, R. H. (1970). *Communities and Ecosystems*. Macmillan 162p.

Appendix

Table 1. Flora- evaluation stations

Sector	Station code	Geographical coordinates UTM (18 L)		High	Geographical coordinates UTM (18 L)		High	Vegetation unit
		East	North		East	North		
Sector 3	S3-P1	477061	9252674	169	477080	9252687	195	Low-hill forest
Sector 3	S3-P2	477073	9252819	166	477093	9252865	167	Low-hill forest
Sector 3	S3-P3	477269	9252678	166	477322	9252686	171	Low-hill forest
Sector 3	S3-P4	477373	9253536	169	477430	9253532	160	Low-hill forest
Sector 3	S3-P5	477665	9253533	161	477713	9253512	159	Low-hill forest
Sector 2	S2-P1	481142	9252873	148	481187	9252848	146	Low-terrace forest
Sector 2	S2-P2	480874	9252962	148	480874	9252917	140	Low-terrace forest
Sector 2	S2-P3	481160	9253065	139	481210	9253049	149	Low-terrace forest
Sector 2	S2-P4	480695	9253019	144	480656	9252993	144	Low-terrace forest
Sector 2	S2-P5	480650	9253254	144	480616	9253223	146	Low-terrace forest

Source: ASD, 2021

Table 2. Birds – evaluation stations

Sector	Station code	Geographical coordinates UTM (18 L)		Vegetation unit	Comments
		East	North		
Sector 3	S3-0	476744	9252420	Low-hill forest	Evaluation of bird fauna according to lineal transect methodology within zone 3 of the area of study was of 21 sample stations, separated every 100 meters, summing 2000 meters (2 km) of evaluation, information gathering, and important data collection. This is located in the vegetation unit of the Low-hill forest (Btb), the initial station is S3-0 and it ends in S3-20.
Sector 3	S3-1	476765	9252596	Low-hill forest	
Sector 3	S3-2	476782	9252688	Low-hill forest	
Sector 3	S3-3	476814	9252785	Low-hill forest	
Sector 3	S3-4	476837	9252877	Low-hill forest	
Sector 3	S3-5	476863	9252921	Low-hill forest	
Sector 3	S3-6	476886	9253075	Low-hill forest	
Sector 3	S3-7	476900	9253172	Low-hill forest	
Sector 3	S3-8	476909	9253276	Low-hill forest	
Sector 3	S3-9	476958	9253375	Low-hill forest	
Sector 3	S3-10	476973	9253479	Low-hill forest	
Sector 3	S3-11	477062	9253479	Low-hill forest	
Sector 3	S3-12	477164	9253497	Low-hill forest	
Sector 3	S3-13	477331	9253527	Low-hill forest	
Sector 3	S3-14	477377	9253528	Low-hill forest	
Sector 3	S3-15	477470	9253525	Low-hill forest	
Sector 3	S3-16	477575	9253549	Low-hill forest	
Sector 3	S3-17	477667	9253527	Low-hill forest	
Sector 3	S3-18	477784	9253487	Low-hill forest	
Sector 3	S3-19	477881	9253463	Low-hill forest	
Sector 3	S3-20	477981	9253434	Low-hill forest	
Sector 2	S2-0	477115	9277849	Low-terrace forest	

Sector	Station code	Geographical coordinates UTM (18 L)		Vegetation unit	Comments
		East	North		
Sector 2	S2-1	480364	9252938	Low-terrace forest	Evaluation of bird fauna according to lineal transect methodology within zone 2 of the area of study was of 21 sample stations, separated every 100 meters, summing 2000 meters (2 km) of evaluation, information gathering, and important data collection. This is located in the vegetation unit of the Low-terrace Forest (Btb), the initial station is S2-0 and it ends in S2-20.
Sector 2	S2-2	480462	9252908	Low-terrace forest	
Sector 2	S2-3	480562	9252887	Low-terrace forest	
Sector 2	S2-4	480660	9252865	Low-terrace forest	
Sector 2	S2-5	480764	9252846	Low-terrace forest	
Sector 2	S2-6	480848	9252815	Low-terrace forest	
Sector 2	S2-7	480945	9252781	Low-terrace forest	
Sector 2	S2-8	481040	9252752	Low-terrace forest	
Sector 2	S2-9	481141	9252724	Low-terrace forest	
Sector 2	S2-10	481233	9252699	Low-terrace forest	
Sector 2	S2-11	481328	9252680	Low-terrace forest	
Sector 2	S2-12	481428	9252667	Low-terrace forest	
Sector 2	S2-13	481526	9252650	Low-terrace forest	
Sector 2	S2-14	481627	9252635	Low-terrace forest	
Sector 2	S2-15	481728	9252628	Low-terrace forest	
Sector 2	S2-16	481826	9252606	Low-terrace forest	
Sector 2	S2-17	481923	9252592	Low-terrace forest	
Sector 2	S2-18	482021	9252579	Low-terrace forest	
Sector 2	S2-19	482120	9252562	Low-terrace forest	
Sector 2	S2-20	482218	9252545	Low-terrace forest	

Source: ASD, 2021

Table 3. Mammals- evaluation stations

Sector	Station code	Geographical coordinates UTM (18 L)		High	Geographical coordinates UTM (18 L)		High	Vegetation unit	Comments
		East	North		East	North			
Sector 3	S3-A	476745	9252480	185	477981	9253434	164	Low-hill forest	Forest in good status of conservation, transect of 2km
Sector 2	S2-B	480272	9252953	126	482218	9252545	140	Low-terrace forest	flood zones, transect of 2 km long
Sector 3	Trampa cámara 1	476761	9252699	136	-	-	-	Low-hill forest	It was placed close to a water trough
Sector 3	Trampa cámara 2	477104	9253495	128	-	-	-	Low-hill forest	It was placed close to a wide gorge

Source: ASD, 2021.

Table 4. Amphibians and reptiles – evaluation stations

Sector	Station code	Geographical coordinates UTM (18 L)		High	Geographical coordinates UTM (18 L)		High	Vegetation unit	Comments
		East	North		East	North			
Sector 2	S2-A	480272	9252953	126	480466	9252906	136	Low-terrace forest	flood zones with presence of coca leaf plantation
Sector 2	S2-B	480748	9252849	133	480936	9252789	119	Low-terrace forest	flood zones with presence of purmas
Sector 2	S2-C	481237	9252701	138	481437	9252667	140	Low-terrace forest	flood zones zonas inundables
Sector 3	S3-A	476745	9252480	185	476785	9252690	165	Low-hill forest	forests in good status of conservation
Sector 3	S3-B	476863	9252971	176	476899	9253174	175	Low-hill forest	forests in good status of conservation
Sector 3	S3-C	476972	9253483	158	477183	9253512	164	Low-hill forest	forests in good status of conservation

Source: ASD, 2021.

Table 5. Forestry – evaluation stations

Sector	Station code	Geographical coordinates UTM (18 L)		High	Geographical coordinates UTM (18 L)		High	Vegetation unit	Comments
		East	North		East	North			
Sector 3	P3	477065	9252664	159	476794	9252651	152	Low-hill forest	Streams were empty by empty season
Sector 2	P2	480944	9253155	132	480666	9253144	142	Low-terrace forest	Streams were empty by empty season

Source: ASD, 2021.

Table 6. Areas of interest

Sector	Code	Type: BSA or intervention area	Type	Description	Geographical coordinates UTM (18 L)		High	Area	Vegetation unit
					East	North			
Sector 3	Bdero	BSA	Bebedero		476761	9252699	133	5m2	Low-Hill forest
Sector 3	Cmdero	BSA	Comedero		477124	9256334	135	2m2	Low-Hill forest
Sector 3	Horm	BSA	Hormiguero		478580	9253312	138	2m2	Low-hill forest
Sector 2	C	Intervened area	claro	cetical	480375	9252938	136	-	Low-terrace forest
Sector 2	C	Intervened area	Claro		480286	9252959	127	-	Low-terrace forest
Sector 2	C	Intervened area	Claro		480310	9252950	132	-	Low-terrace forest
Sector 3	C	Intervened area	Claro	producto de una carretera	478657	9253276	173	-	Low-hill forest
Sector 3	C	Intervened area	Claro	producto de un desbroce	479079	9253221	164	-	Low-hill forest
Sector 2	C	Intervened area	Claro	claro natural de zona inundable que predomina el sogal	480846	9252814	132	-	Low-terrace forest
Sector 2	C	Intervened area	Claro	-	480328	9252951	135	-	Low-terrace forest
Sector 2	C	Intervened area	Claro	-	480337	9252948	134	-	Low-terrace forest
Sector 2	Pu	Intervened area	Purma	cocal abandonado	480481	9252903	135	-	Low-terrace forest

Source: ASD, 2021.

Photograph 1. Intervened Zone – Logging Trail



Photograph 2. Intervened Zone – “Clear”



Photograph 3. “Jaguar” footprint *Panthera onca*



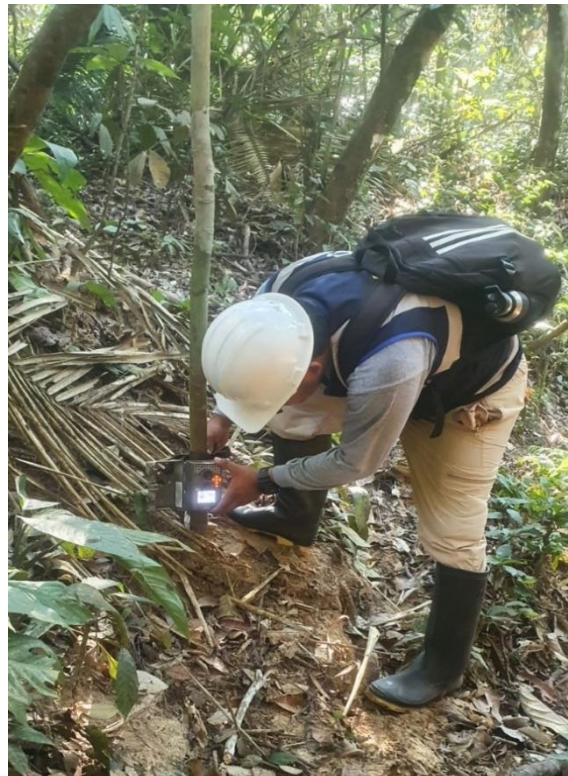
Photograph 4. “Jaguar” rascadero *Panthera onca*



Photograph 5. “Tapir” footprint *Tapirus terrestris*



Photograph 6. Installation of Camera Trap



Photograph 7. *Formicarius colma* Individual



Photograph 8. *Mionectes oleagineus* Individual



Photograph 9. *Adenomera andreae* Individual



Photograph 10. *Boana almendarizae* Individual



Photograph 11. *Edalhorina perezii* Individual



Photograph 12. "Stump" Register



Photograph 13. Tree with plate Register



Photograph 14. Coca leaf Plantation



Photograph 15. Swamp



Photograph 16. Marked tree

