New Planting Procedures Palmicultores San Nicolás S.P.R. de R.L.

Assessment Sumaries and Management Plans

Campeche and Tabasco States México

PALMICULTORES SAN NICOLÁS

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1. OVERVIEW AND BACKGROUND

1.1 Area of New Planting and development Plan

Plantation properties (new and existing) are located in the states of Campeche (95.37%) and Tabasco (4.63%), on the southeastern region of Mexico. These properties fall under the jurisdictions of the municipalities of Palizada and Carmen in Campeche (Northern Zone), Jalapa and Tacotalpa in Tabasco (Western Zone), and Balancán in Tabasco (Eastern Zone) (Figure 1). Total area of new and existing plantations is 13.584,81 ha. This area corresponds to the areas indirectly affected by each of the estates as defined by the different biotic and abiotic components of the project.

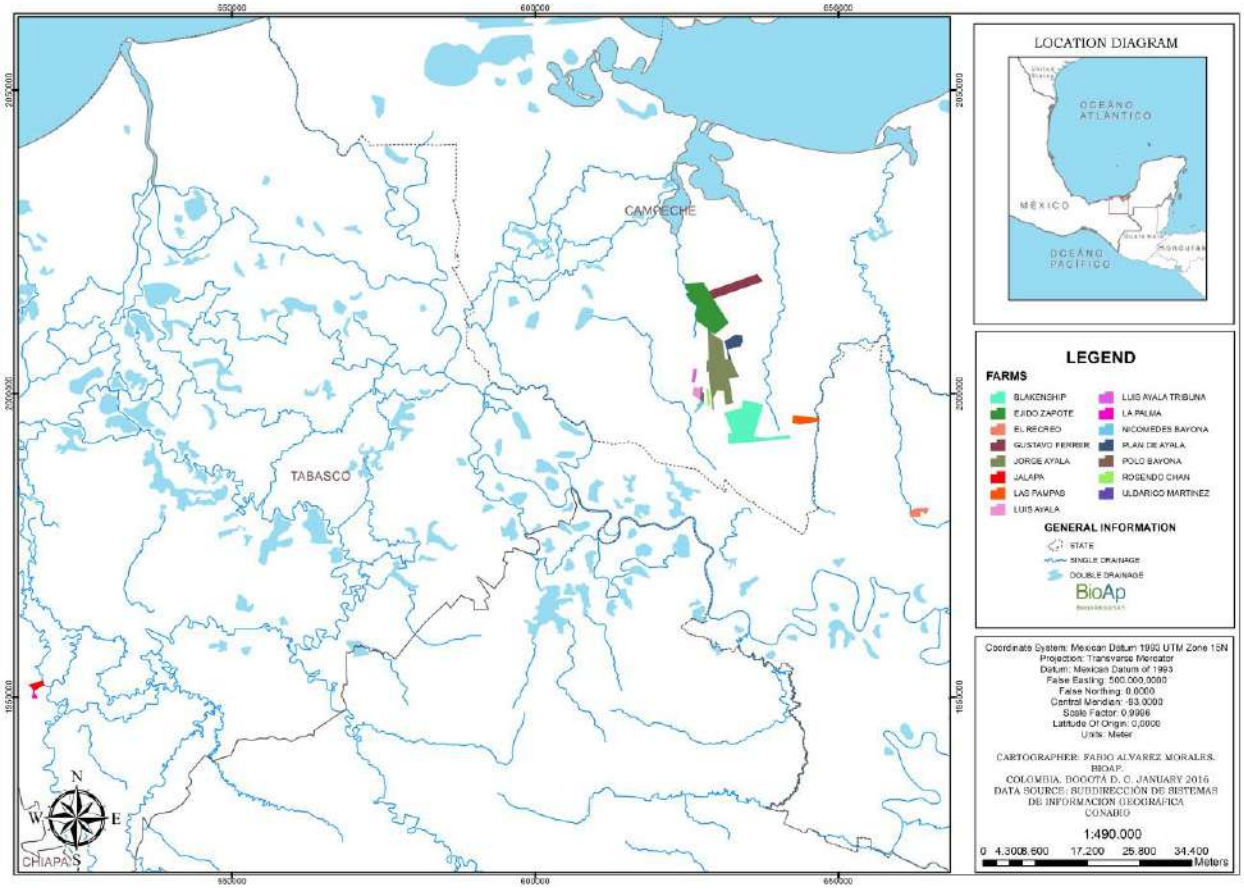


Figure 1. General Location of new and existing properties in the states of Campeche and Tabasco

Source: BioAp S.A.S., 2015

The potentially sowing area corresponds to 10.355 ha that are suitable for palm oil plantations, of which 1.099 ha have already been planted (Figure 2, Figure 3, Figure 4), however they are presently at establishment stage and engaged in weed and pest control activities.

Taking in consideration the HCV and SEIA recommendations, Palmicultores San Nicolas will initiate negotiations with strategic partners from the regions to own or lease new plantation estates, that is why the total area of new plantations for 2017 would be just 1.019,57 ha.

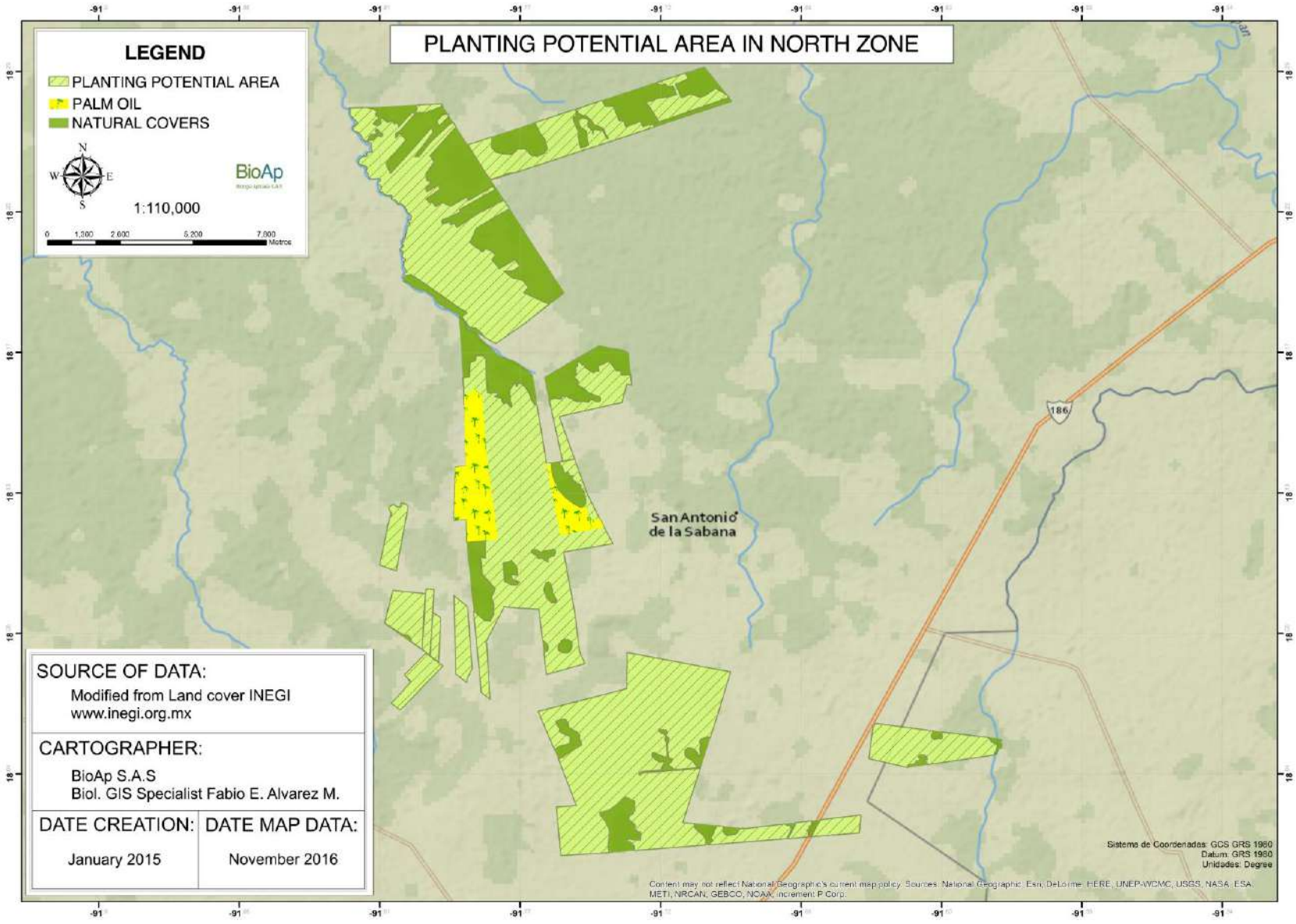


Figure 2. Potential sowing area and current plantations at Northern Zone

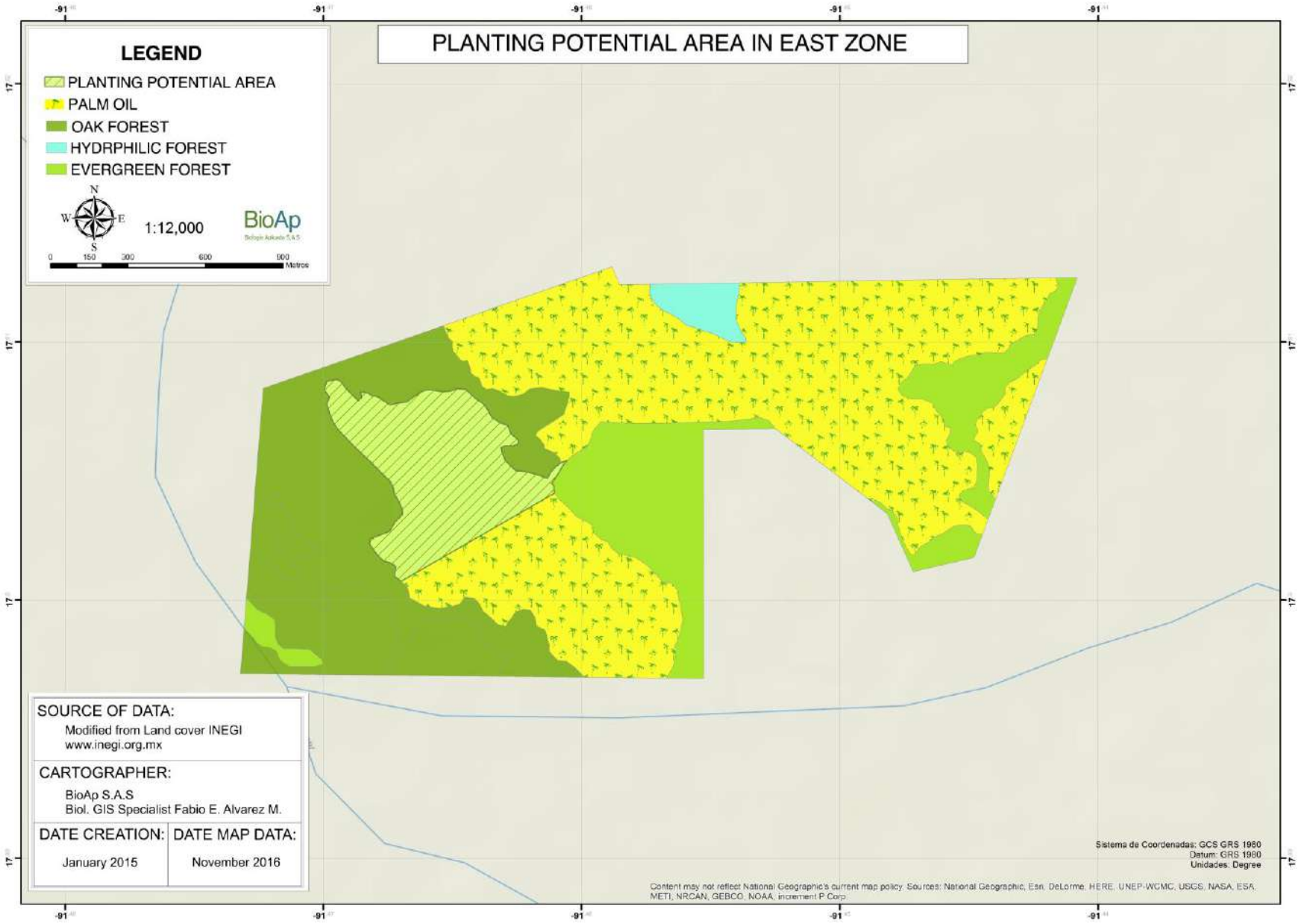


Figure 3. Potential sowing area and current plantations at Eastern Zone

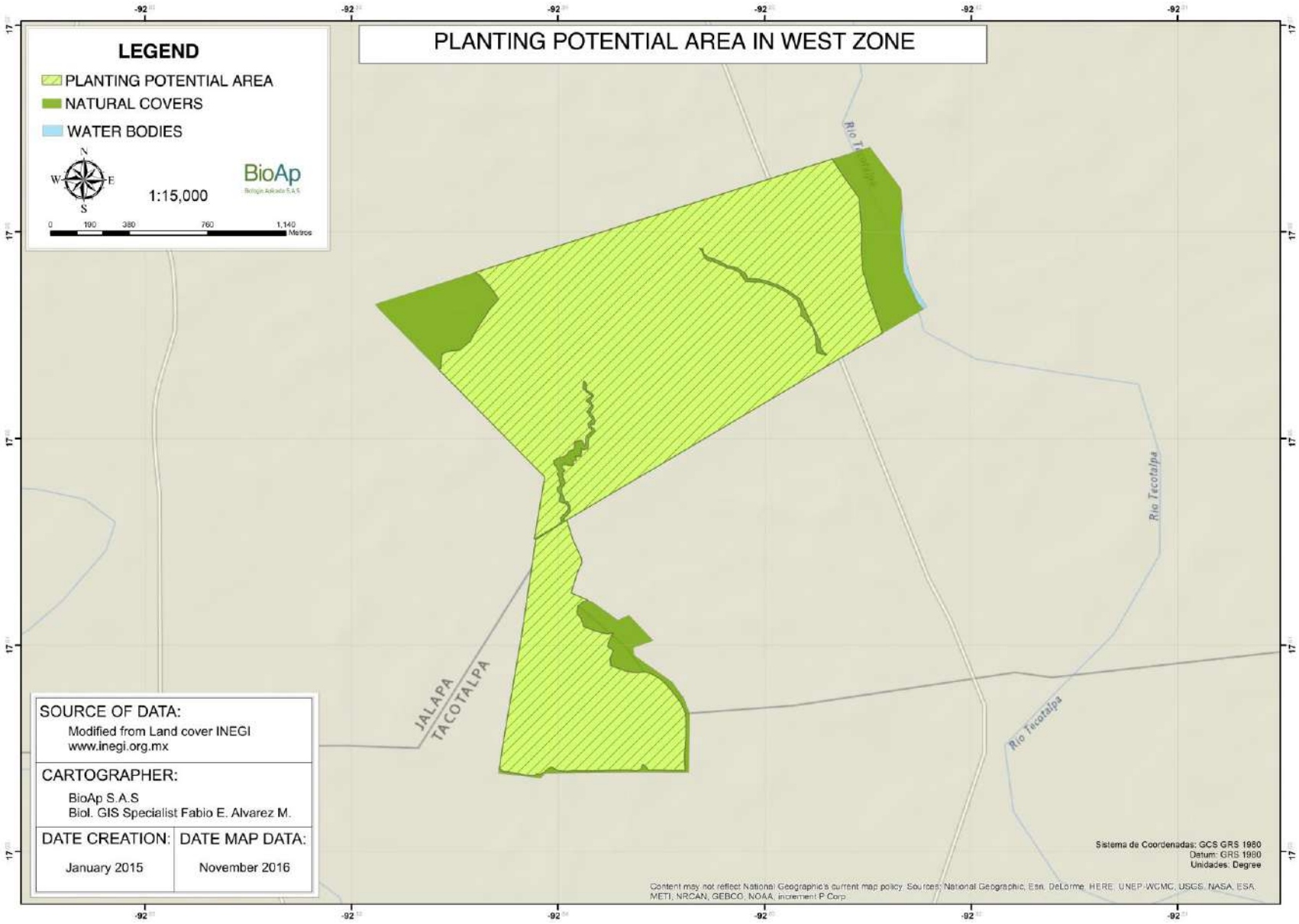


Figure 4. Potential sowing area at Western Zone

Table 1 shows the proposed development Schedule for the new plantings.

Table 1. Schedule for new Plantings

Zone	Ground	Municipality	Total Area (ha)	Potential Planting Area (ha)	HCV Area (ha)	Developments for 2017	Proposed timeline for Development
Northern	Plan de Ayala	Carmen	568,12	310,5	257,62	150	May - Oct 2017
	Ejido Zapote	Carmen	3086,75	1838,94	1247,81	88,91	May - Oct 2017
	Luis Ayala	Carmen	198,48	191,1	7,38	191,1	May - Oct 2017
	Rosendo Chan	Carmen	136,46	136,46	0	136,46	May - Oct 2017
	Polo Bayona	Carmen	44,74	44,74	0	44,74	May - Oct 2017
	Nicomedes Bayona	Carmen	124,39	121,9	2,49	121,9	May - Oct 2017
Western	La Pampa	Jalapa	294,02	253,09	40,93	253,09	May - Oct 2017
	Jalapa	Jalapa					
Eastern	El Recreo	Balancan	328,67	33,37	295,3	33,37	May - Oct 2017
TOTAL			**4781,63**	**2930,1**	**1851,53**	**1019,57**	

Source: BioAp S.A.S 2016

1.2 Land Cover

1.2.1 Northern Zone

This zone is composed of three natural and one anthropic origin land covers. The largest of new plantations area is covered by Agricultural, livestock, forestry Cover (9.910,15 ha). According to the natural land covers, the one that has the greatest extent is the Perennial Secundary Dense Forest -PSCC (3,039,47 ha), followed by Primary Dense Thorn Forest- EPCC (28,99 ha) and the Secundary Oak Forest – QSCC (11,51 ha). Figure 5 shows the distribution of every land cover in every ground.

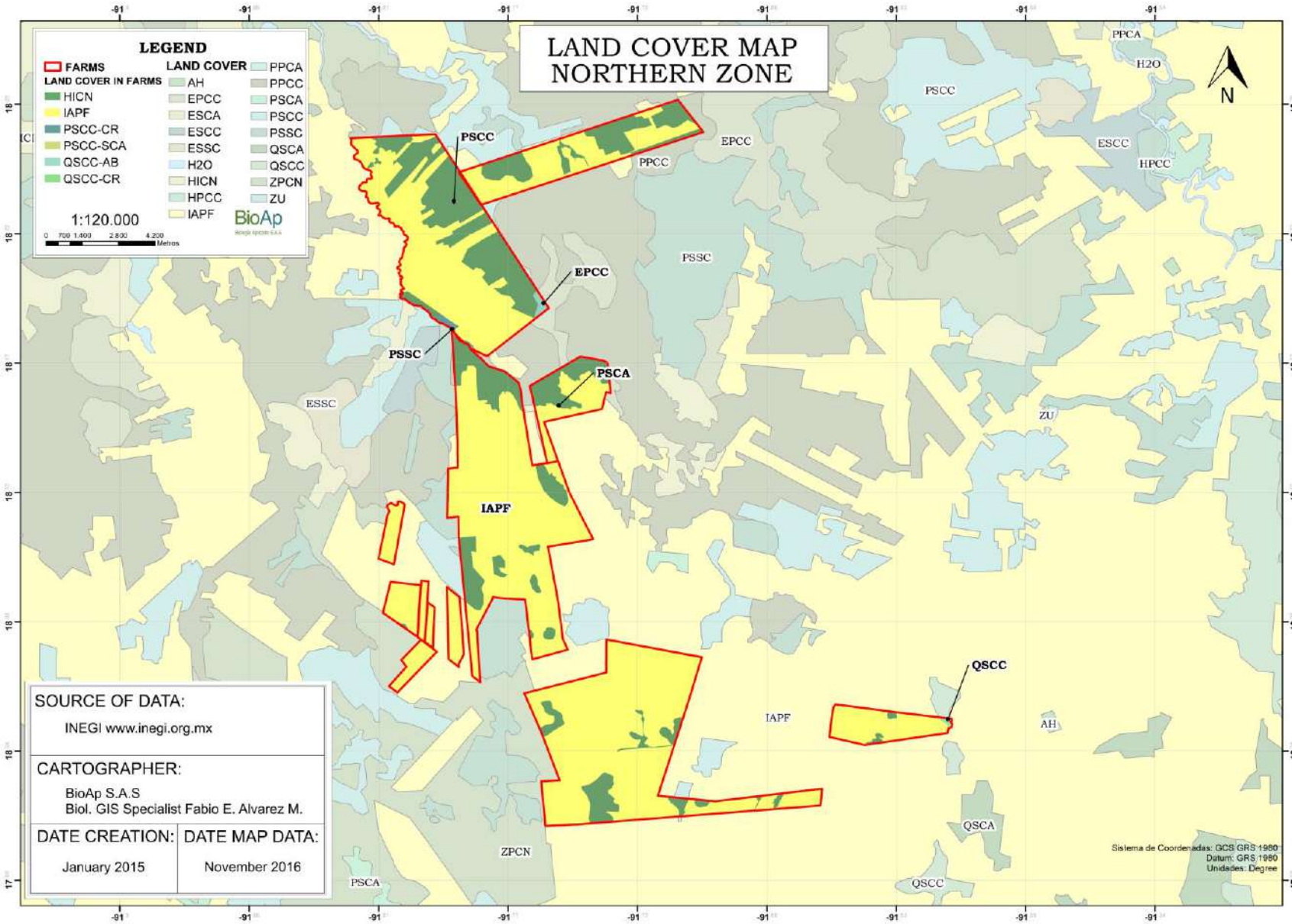


Figure 5. Land Cover map Northern Zone

1.2.2 Western Zone

Western Zone farms have four land covers. Natural land covers are composed of Perennial Secundary Open Forest- PSCA (37,30 ha) and Hydrophilic Vegetation -HICN (2,80 ha). Agricultural and livestock zones - IAPF occupy most of the area (253,1490 ha), folloewd by the Water bodies –H2O (0,77 ha) (Figure 6).

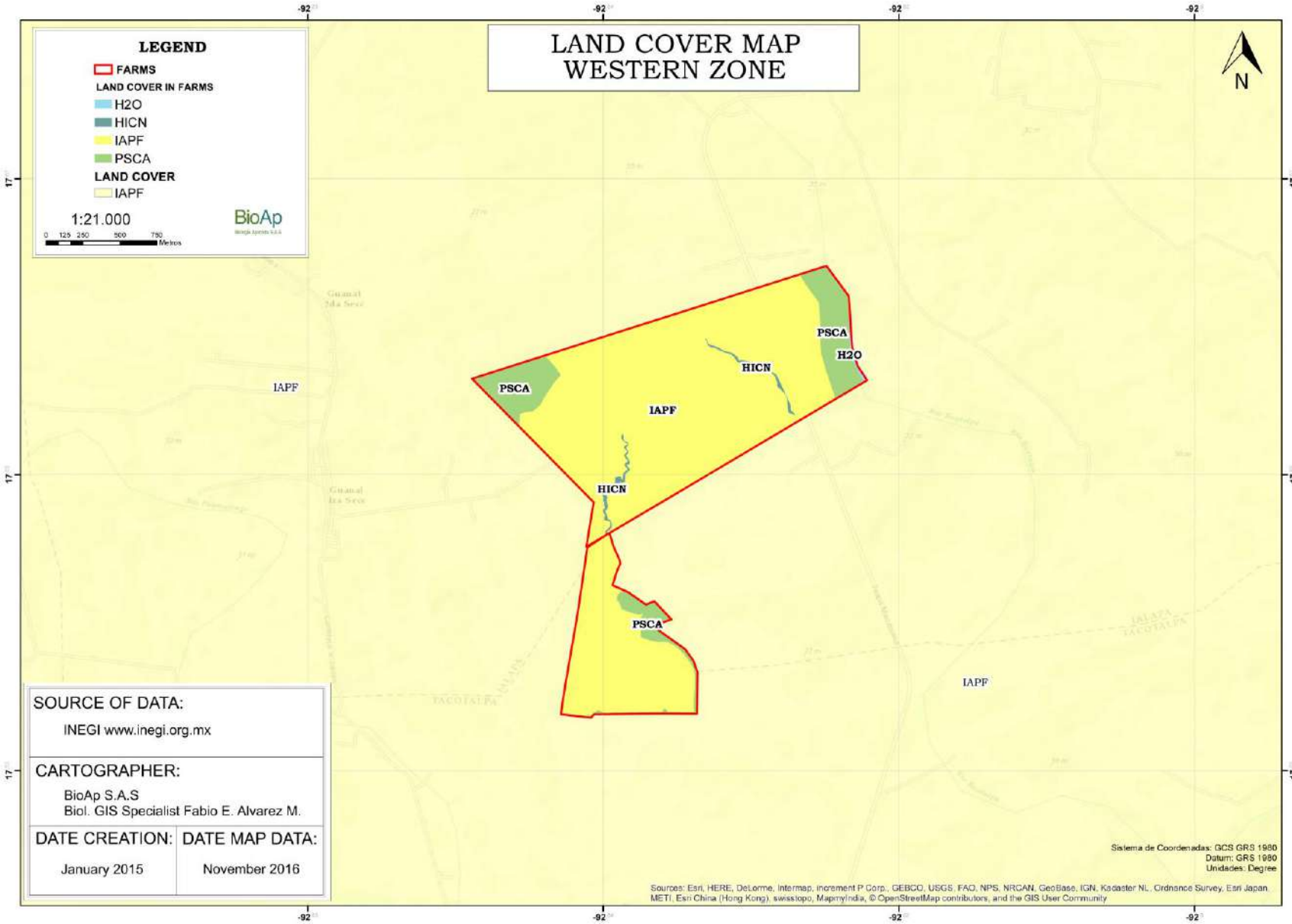


Figure 6. Land Cover map Western Zone

1.2.3 Eastern Zone

Four natural land covers were identified within Eastern Zone (Figure 7), among this there is the Secundary Oak Forest –QSCC (81,74 ha), followed by Secundary Evergreen Forest –PSCA (49,63 ha), Hydrophilic Forest -HICN (5,26 ha). The last one corresponds to no natural land cover Agricultural, livestock, forestry Cover - IAPF that has the largest extension (191,86 ha).

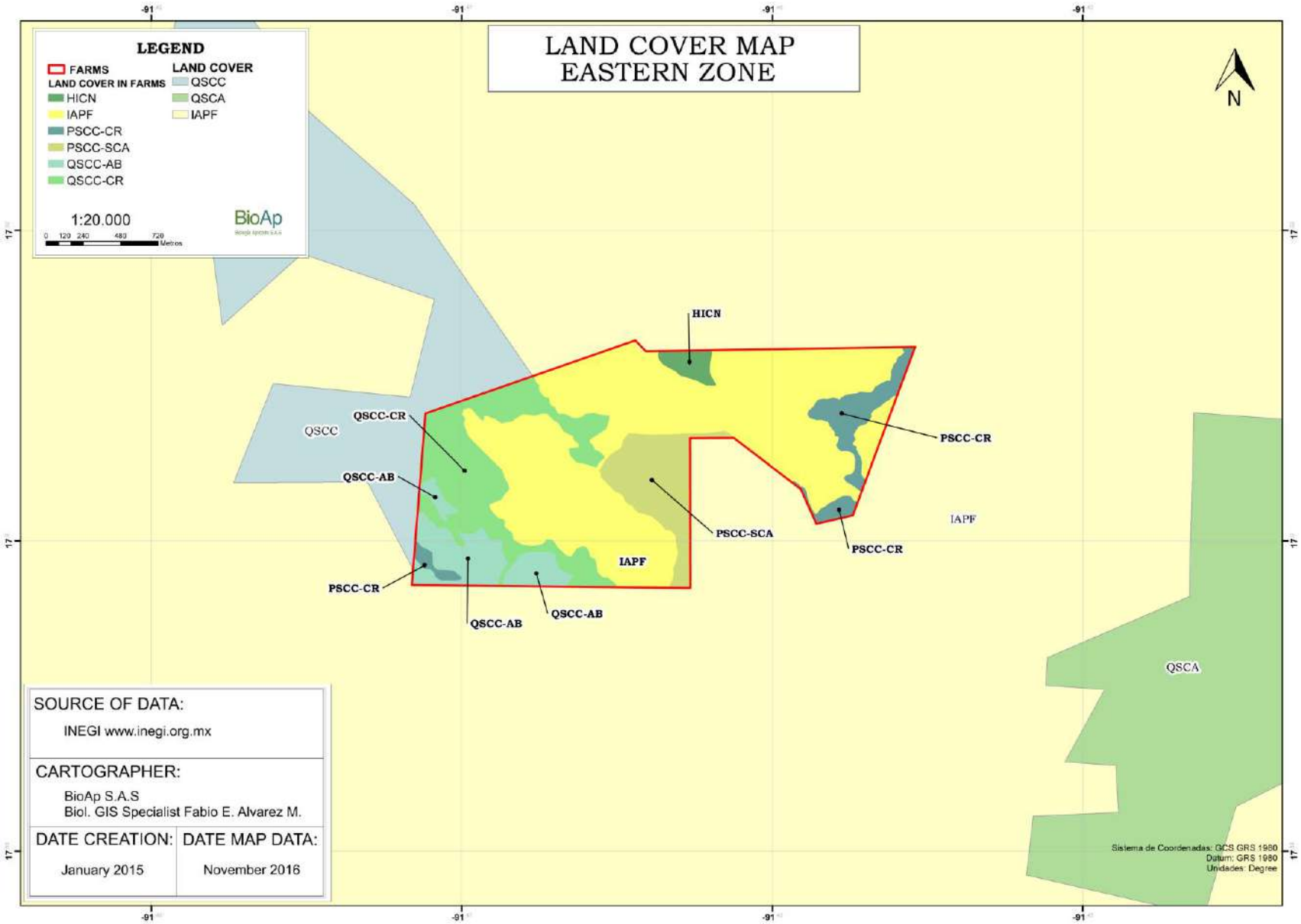


Figure 7. Land Cover map Eastern Zone

1.3 Soil Maps

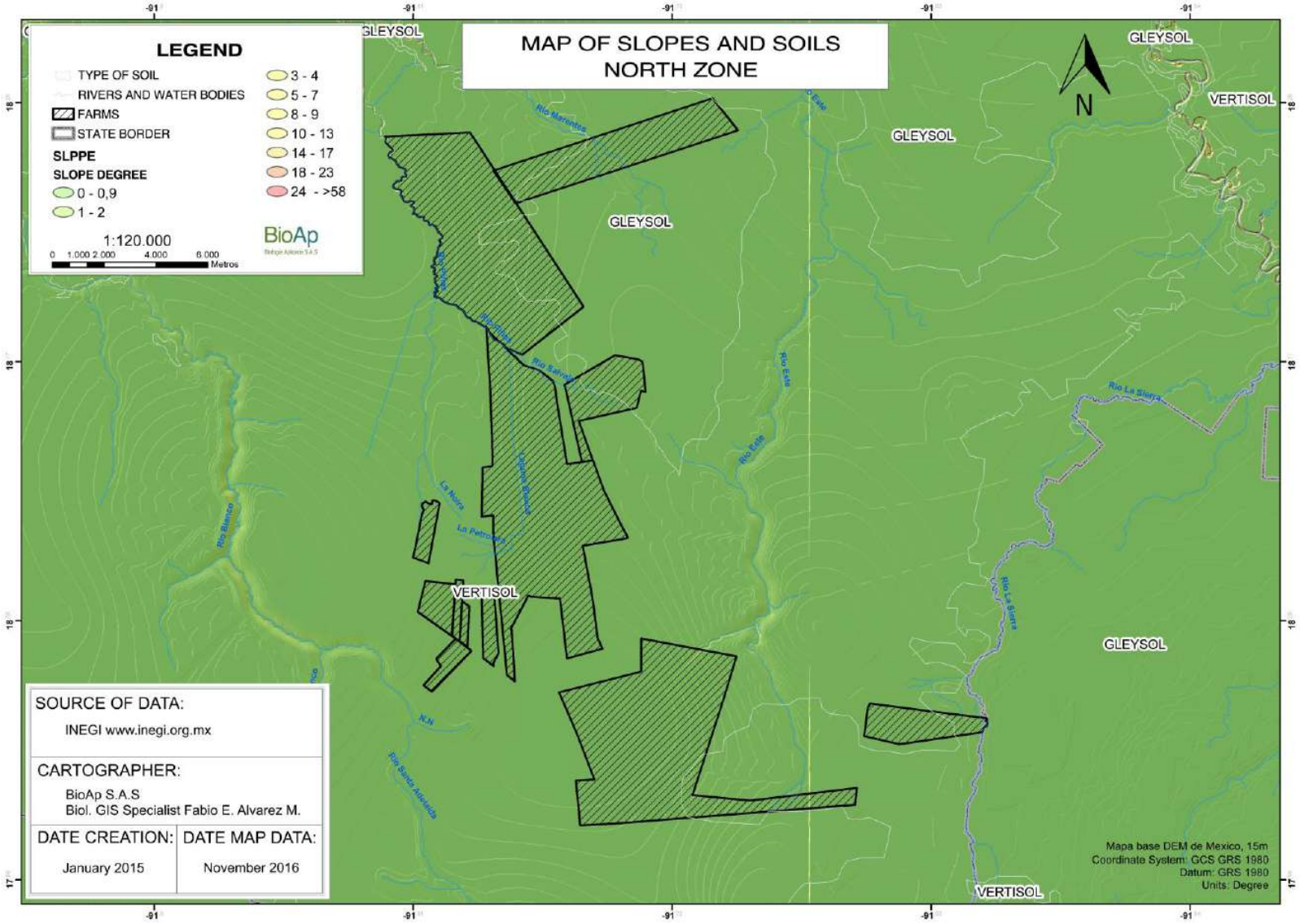


Figure 8. Areas of soil vulnerability for the Northern Zone

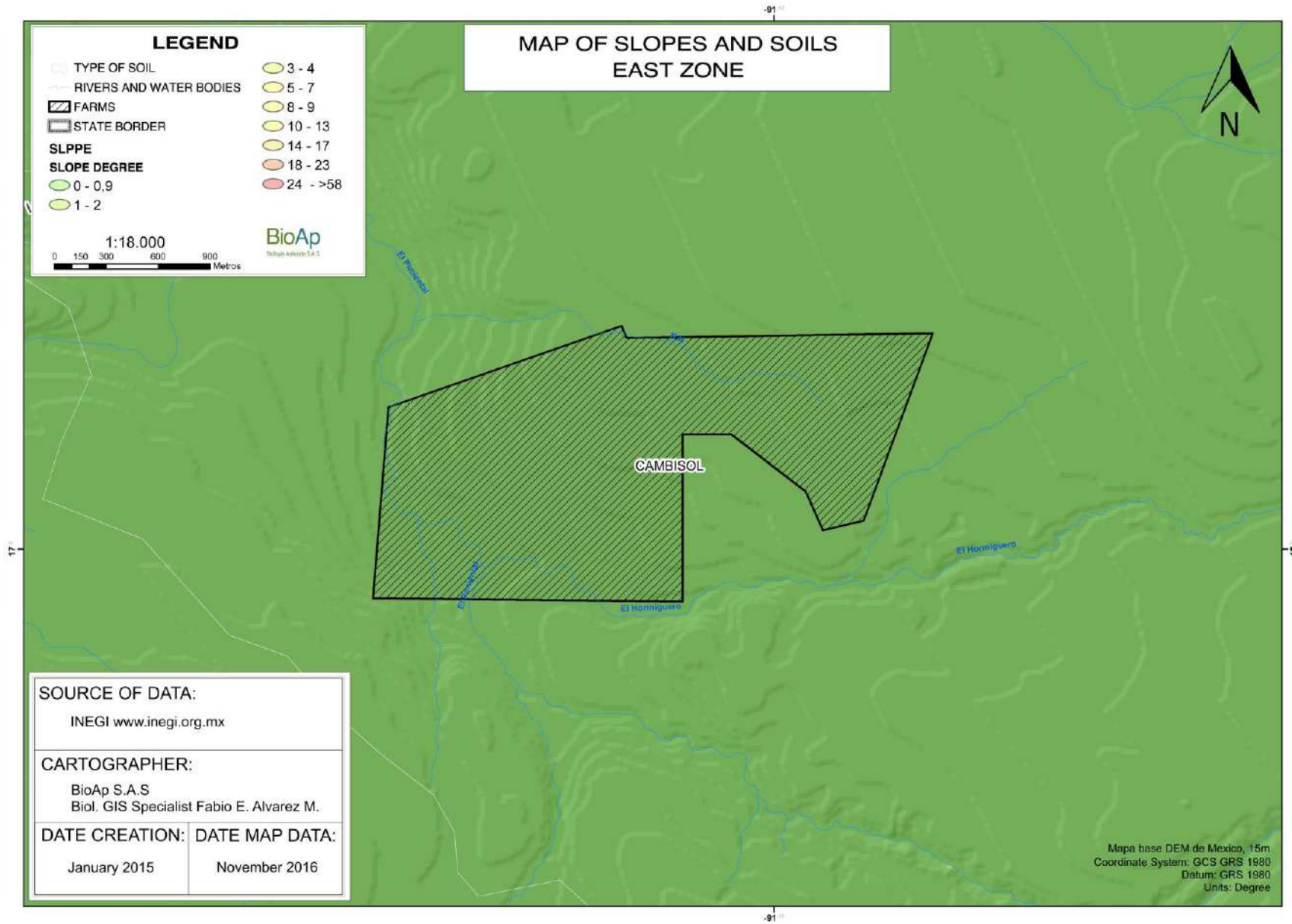


Figure 9. Areas of soil vulnerability for the Eastern Zone

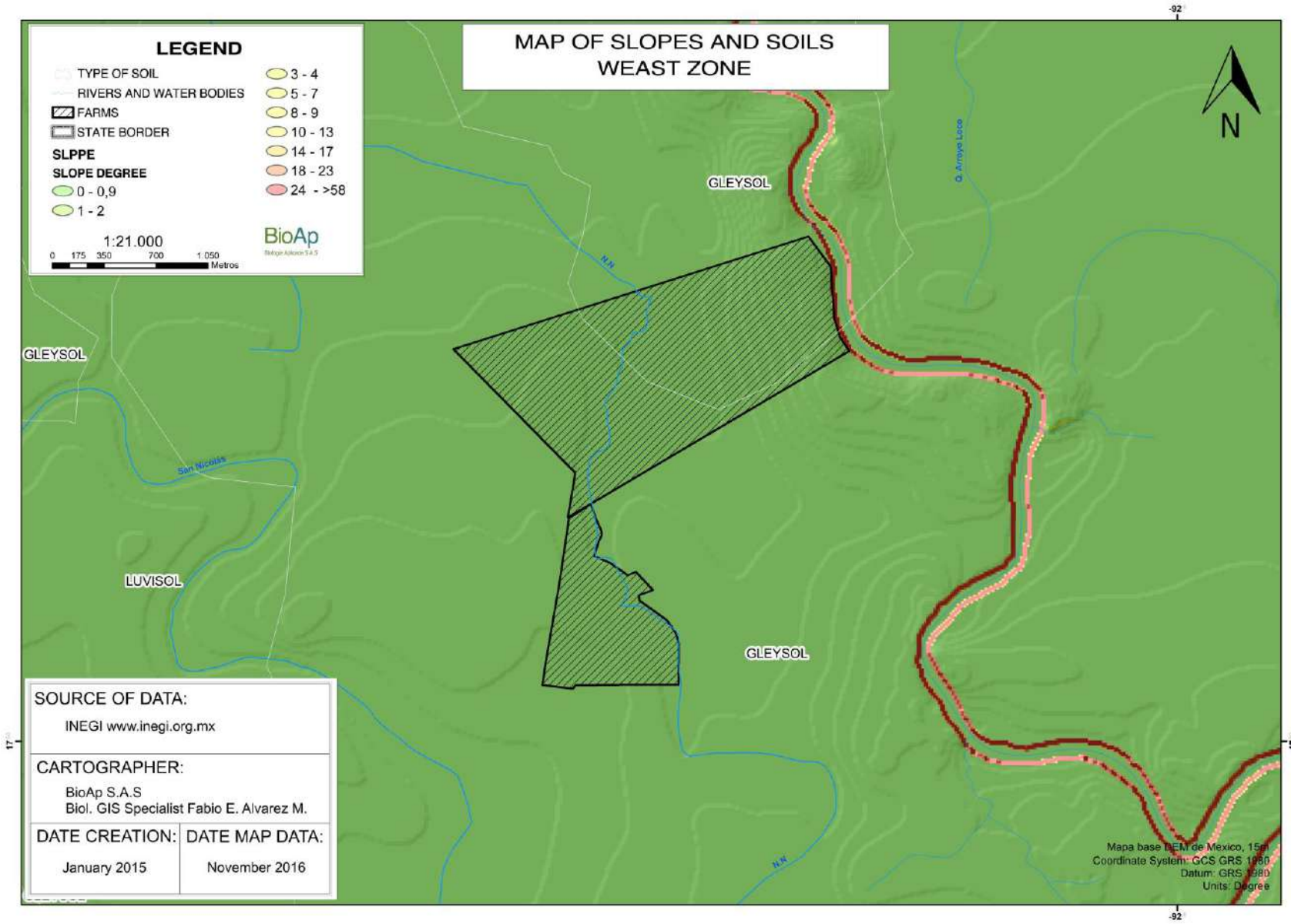


Figure 10. Areas of soil vulnerability for the Weastern Zone

2. ASSESSMENT PROCESS AND METHODS

2.1 SEIA Assessment

The aim of Social and Environmental Impact Assessment-SEIA is to identify social and environmental baseline that takes into account both biotic and abiotic factors. Then it must determine all activities involved in the cultivation process or the creation of new plantings to further evaluate the impacts on biodiversity and the surrounding communities. Ultimately it must put forward strategies so that they can reduce, mitigate, manage and/or offset any and all negative impacts.

Present SEIA was conducted from August to December 2015.

2.1.1 Assessor's Credentials

The team crew who developed the SEIA and their profile are:

Name	Vocational Training	Work Experience
Rodrigo Ramírez Sandoval	Biologist	Environmental Impact Studies Specialist. Working experience in development in Research Projects with emphasis on the interaction of natural resources and the alterations that are generated in the development of infrastructures.
Juan Pablo Zorro	Biologist	Wildlife Component and Conservation Studies. Working experience on Environmental Impact and Conservation Studies for public and private sector in different areas. Experience as HCV assessor in Mexico, Ecuador and Colombia
Diego A. Rodriguez	Biologist – Botany	Specialist in Botany. Working experience on Environmental Impact and Conservation Studies for public and private sector in different areas. Experience as HCV assessor in Mexico, Ecuador and Colombia.
Gina Marcela Olarte	Biologist	Wildlife Component. Working experience in conservation and ecology of neotropical mammals for public and private sector, and ONG´s. Experience in HCV studies in Colombia y Ecuador
Fabio Ernesto Alvarez	Biologist – GIS	Geographic information systems Specialist and Environmental Studies professional.
Camilo Valencia	Forestry Engineer	Working experience on forest inventories and ecosystem characterization for public and private sector.
Maria Juliana Díaz Rojas	Biologist	Working experience on mining projects in Environmental Impact Studies within Llanos and Amazon colombian regions.
Nathaly Ruiz	Sociologist	Environmental Impact Studies and Social field methods

2.1.2 Methodology

At present there are a variety of methods for the assessment of environmental impacts, Vicente Conesa Fernández (ad hoc) made a cause-effect matrix that is able to analyze eight parameters and at the same time establishing a series of attributes within those parameters (Table 2).

Table 2. Atributes for assessing environmental impacts

Criteria	Description
Nature	Refers to whether the generated impact is positive or negative
	Beneficial Impacts (+)
	Negative Impacts (-)
1. Extent (Ex)	Measures the impact's area of influence as it pertains to the project's activities.
	Rating Scale:
	Detailed 1
	Partial 2
	Extensive 4
2. Moment (Mo)	Time elapsed between the onset of action and the early effects on the environment are taken into consideration.
	Rating Scale:
	Long Term 1
	Mid Term 2
	Immediate 4
3. Reversibility (Rv)	The possibility to reconstruct any given element that is affected by any given activity to its original state only using natural means.
	Rating Scale:
	Short Term1
	Mid Term 2
	Irreversible 4
4. Recoverability (Mc)	The possibility to reconstruct any given element affected by any given activity to its original state where human intervention is involved.
	Rating Scale:
	Immediate Recoverability 1
	Mid Term Recoverability 2
	Irrecoverable 4
5. Synergy (Si)	Occurs when the impact of two simultaneously occurring actions is greater than one that is provoked by actions that act independently of each other.
	Ratings Scale:
	Not Synergistic 1
	Synergistic 2
	Very Synergistic 4
6. Accumulation (Ac)	Refers to the progressive increment of the impact's manifestation when the action that generates it repeats continuously.
	Rating Scale:
	Simple 1
	Cumulative 4
7. Effect (Ef)	Represents the effect's manifestation over any given element as a consequence of any given activity.

Criteria	Description
	Rating Scale:
	Indirect or secondary 1
	Direct or primary 4
8. Periodicity (Pr)	Indicates if the manifestation of an effect over time is cyclical (periodic effect), unpredictable (irregular effect), concentrated (continuous effect)
	Rating Scale:
	Discontinuous irregular effect 1
	Periodic effect 2
	Continuous effect 4

2.1.2.1 Environmental Impact Rating (Ca)

The environmental impact rating (Ca) is the expression of the combined action of the different criteria by which the environmental impact has been classified, and it represents the severity or magnitude of the damage that this is causing. By means of an analytical procedure the group responsible for the environmental assessments at Bioap developed an equation to assess the environmental qualification that allowed them to document and explain the interdependent relationships between the five criteria. The results are as follows:

CA= +-(Ex+Mo+Rv+Mc+Si+Ac+Ef+Pr)

Where:
Ex= Extent
Mo= Moment
Rv= Reversibility
Mc= Recoverability
Si= Synergy
Ac= Accumulation
Ef= Effect
Pr= Periodicity

There is a Chroma key used to identify negative impacts that have been previously identified and qualified (Table 3).

Table 3. Chroma key to identify negative environmental impacts

TYPE OF ACTIVITY	INDIVIDUAL RELEVANCY RANGE	RELEVANCY RANGE
SEVERE IMPACT	> 23	**> 241**
SIGNIFICANT IMPACT	16 - 23	160 - 240
MODERATE IMPACT	9– 16	80 - 160
LOW IMPACT	8	< 80

Positive impacts that have been previously identified and quantified have a different Chroma key and can be identified as follows (Table 4).

Table 4. Chroma key identify positive environmental impacts

TYPE OF ACTIVITY	INDIVIDUAL RELEVANCY RANGE	RELEVANCY RANGE
HIGHLY BENEFITIAL	> 20	> 200
MODERATELY BENEFITIAL	10 - 20	100 - 200
MINIMALLY BENEFICIAL	< 10	< 100

2.1.2.2 Environmental assessment analysis

Once the environmental and social impacts assessment is finished, we proceed to analyze the results obtained for the three areas of study, and the results with and without the project.

2.1.2.2.1 Environmental Zoning Management

Environmental zoning management is an instrument of organization and planning necessary to define the environmental sensitivity of the areas that will be affected by the plantation of new or existing zones. They are based on a synthesis of the physical, biotic and socio-economic aspects in terms of fragility, and of relevant social or a relevant ecosystem based on the functions they performed in their respective areas.

Zoning seeks to establish the socio environmental supply of the areas of interest so that the dynamics of the ecosystems can be interpreted better. This will lead to making the necessary decisions against possible interventions by simulating the interrelationships between the different components. Given the current characteristics of the different elements studied in the abiotic, biotic and social aspects present in project's areas of influence, as well as the assessment of the potential environmental impacts that may cause areas to be classified as Areas of exclusion, namely areas that cannot be a part of the project's activities, i.e. areas that cannot be taken over by palm oil project's activities. This category encompasses areas expressly protected by legislation or by provisions of local state authorities, and areas defined by the study, as these zones present a high degree of vulnerability or environmental and social risk, and should not be intervened.

There are also specializated areas where special handling and restrictions depend on the activities, which consist in the different stages of the projects, and the socio-environmental sensitivity of the area should also be taken into consideration. They will be identified by the stipulation of the types of restrictions and actions, or by the technology needed for their protection.

Areas of Intervention and Environmental Management where you can carry out the project's socio-environmental management in accordance to its activities and different stages, because no major restrictions are present with respect to abiotic, biotic and socioeconomic considerations.

Areas of intervention where you can develop any project without having to take into consideration socio-environmental management programs because no major restrictions are raised as seen from the abiotic, biotic and socioeconomic perspective. These areas present a low environmental and social potential, since they does not pose environmental threats due to the presence of current production projects and a synergic environmental degradation.

2.2 LUC Assessment

The aim of Land Use Change/Cover Analysis is to determine the land degradation condition.

The present LUC was conducted on December 2015.

2.2.1 Assessor's Credentials

Name	Vocational Training	Work Experience
Juan Pablo Zorro	Biologist	Wildlife Component and Conservation Studies. Working experience on Environmental Impact and Conservation Studies for public and private sector in different areas. Experience as HCV assessor in Mexico, Ecuador and Colombia.
Fabio Ernesto Alvarez	Biologist - GIS	Geographic information systems Specialist and Environmental Studies professional.

2.2.2 Methodology

2.2.2.1 Acquisition of data (images, maps and additional documentation)

2.2.2.1.1 Landsat Images

Multispectral Landsat images with a 30-meter resolution were used for the interpretation of land use or cover. These images were downloaded from the following site: http://earthexplorer.usgs.gov. Classification of land use from the Landsat images was performed using the "visual classification" method, which is described later on. The specifications for images used are described in Table 5.

Table 5 Satellite images used for the study

Type of Image	Path	Row	Date of Image	Bands	% of cloud cover over plantations
Landsat 7	21	47	27/11/05	1,2,3,4,5	< 2
Landsat 7	21	48	10/10/05	1,2,3,4,5	< 2
Landsat 7	22	48	4/12/05	1,2,3,4,5	< 2
Landsat 7	21	47	19/12/07	1,2,3,4,5	< 2
Landsat 7	21	48	17/11/07	1,2,3,4,5	< 2
Landsat 7	22	48	26/12/07	1,2,3,4,5	< 2
Landsat 7	21	47	5/10/09	1,2,3,4,5	< 2
Landsat 7	21	48	5/10/09	1,2,3,4,5	< 2
Landsat 7	22	48	15/12/09	1,2,3,4,5	< 2
Landsat 8	21	47	26/07/15	1,2,3,4,5	< 2
Landsat 8	21	48	2/07/15	1,2,3,4,5	< 2
Landsat 8	22	48	3/09/15	1,2,3,4,5	< 2

Source: BioAp S.A.S 2015

2.2.2.1.2 Google Earth Images

Due to the low resolution of the Landsat images, it was necessary to make use of Google Earth images from 2003-2015 in order to verify the correct interpretation of cover.

2.2.2.1.3 Maps

The following official maps were also referenced:

INEGI.2015. Uso del suelo y vegetación de México. Datos vectoriales escala 1:1000000. http://www.inegi.org.mx/geo/contenidos/recnat/usosuelo/

- Carta III
- Carta IV
- Carta V

2.2.2.2 Interpretation of satellite images and creation of cover maps for 2005 and 2007, 2009 and 2015.

2.2.2.2.1 Digital processing (data gap correction)

The Landsat images from 2005, 2007 and 2009 contained an error commonly known as 'gaps', which are bands of invalid data caused by failures in the remote sensor components. This banding was corrected with the GAP FILL tool from ArcGIS software. This tool uses an algorithm that corrects information gaps by extrapolating nearby pixels.

Combination of satellite bands

True color: the combination of bands was 321.
False color: the bands were combined to obtain Landsat ETM+ 432 and Landsat 8 543 combinations.

Classification of satellite images

The interpretation of vegetation cover was carried out within the property areas evaluated through visual classification.

Cover classification was performed using the Corine Land Cover methodology adapted. Similarly, the interpretation of Landsat images was adjusted with information obtained from Google Earth images. **Figure 11** to Figure 22 show cover maps of PSN core plantations for the years 2005, 2007, 2009 and 2015.

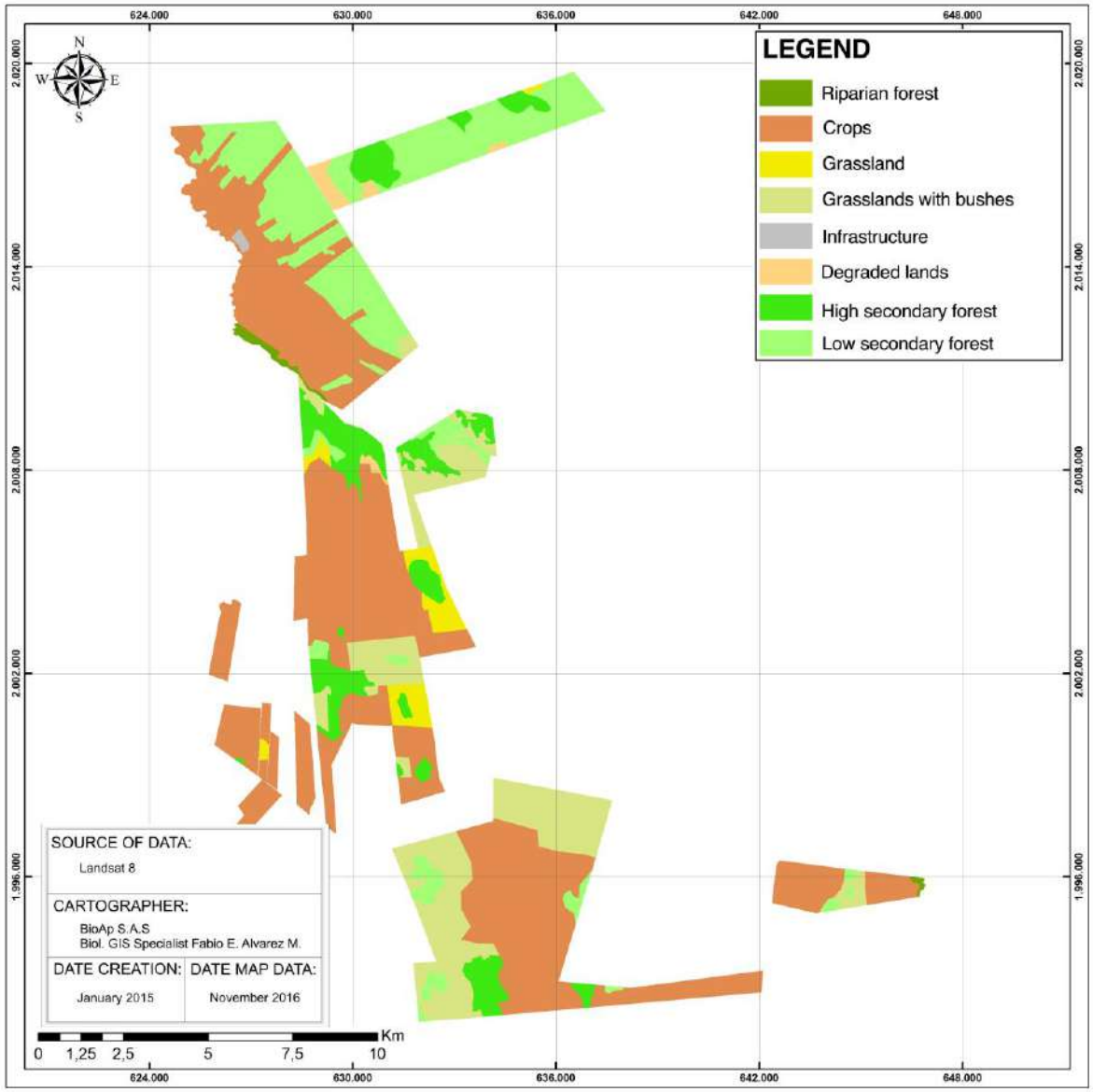


Figure 11. Land cover Northern Zone 2005

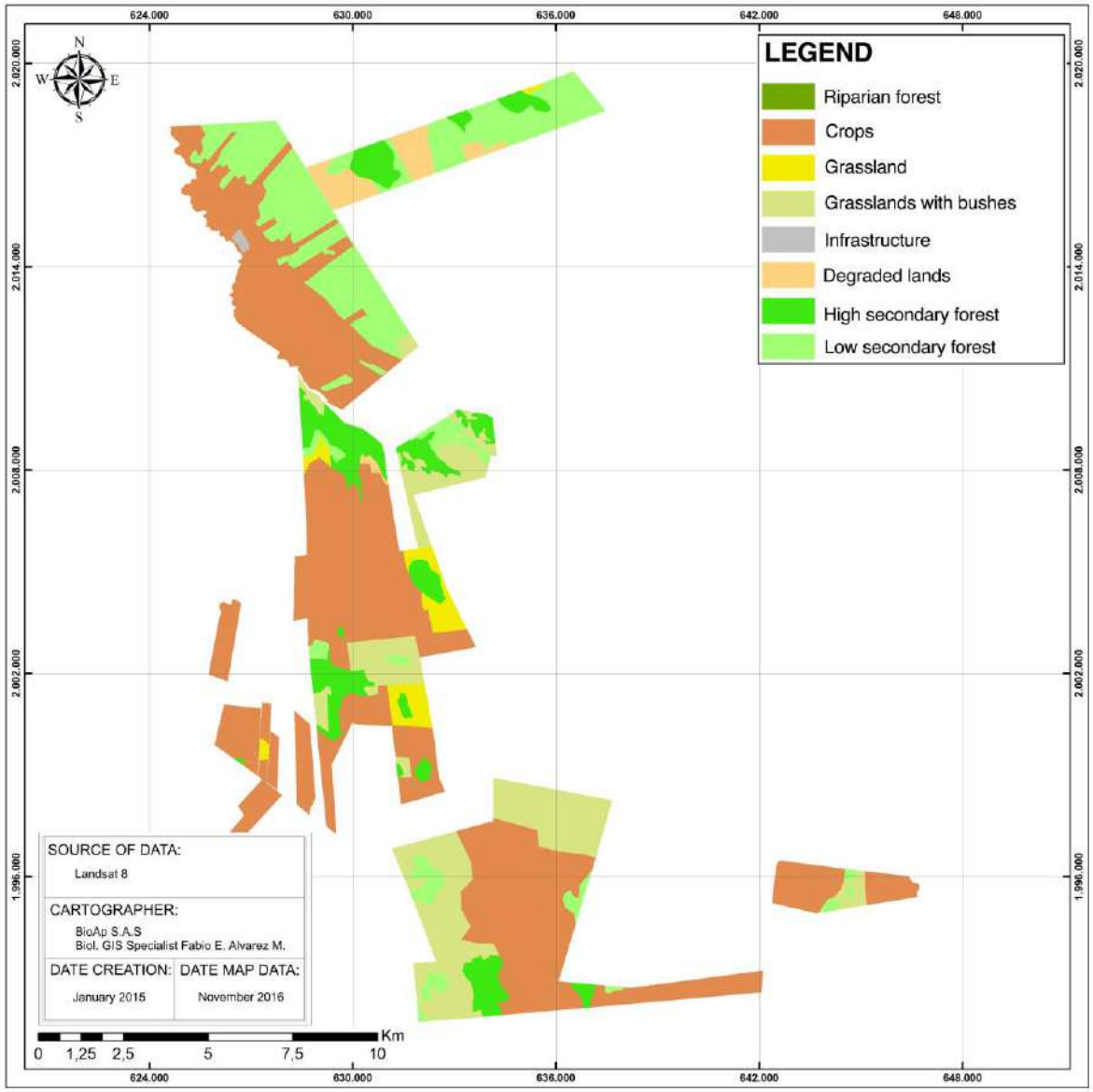


Figure 12. Land cover Northern Zone 2007

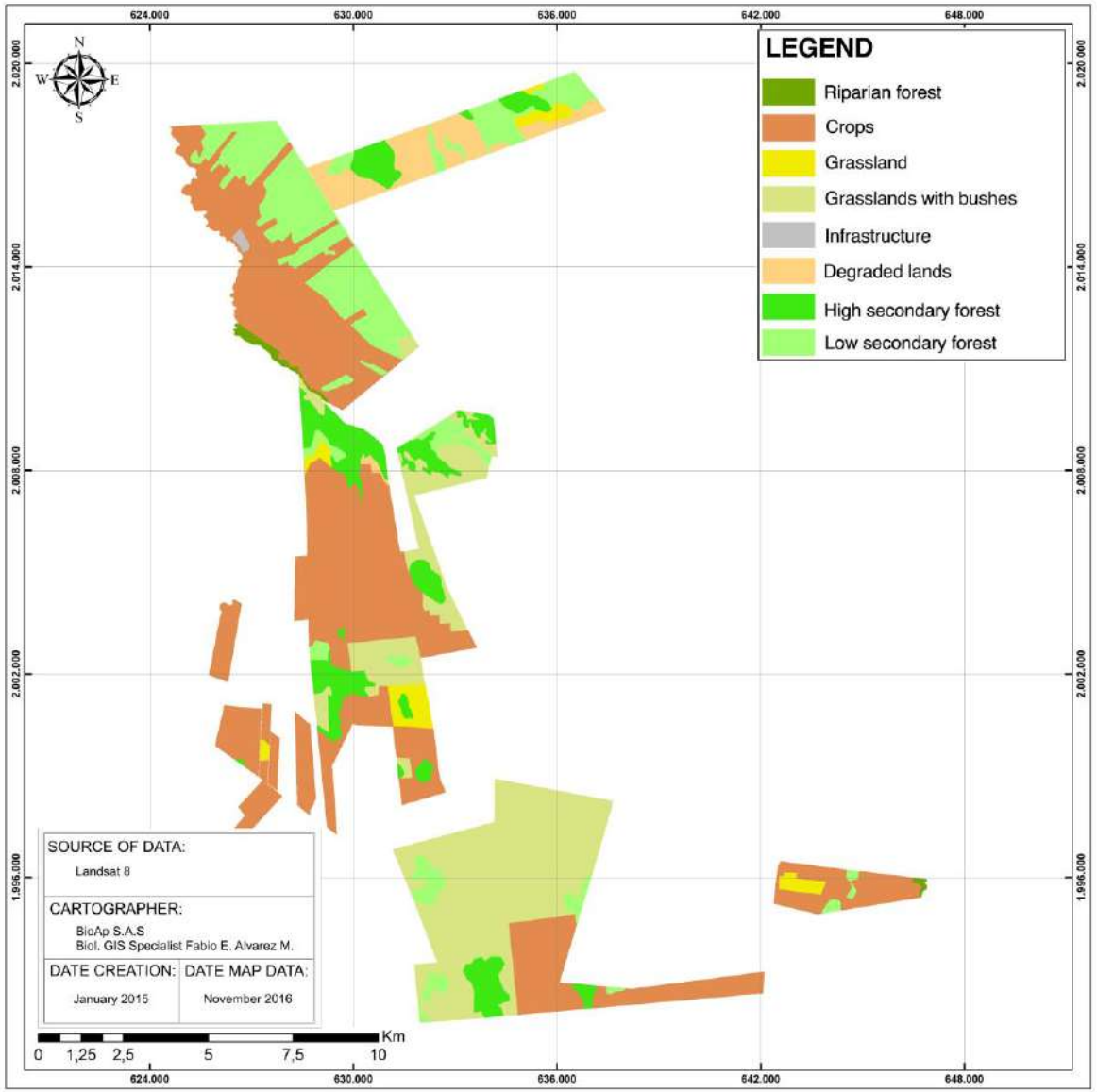


Figure 13. Land cover Northern Zone 2009

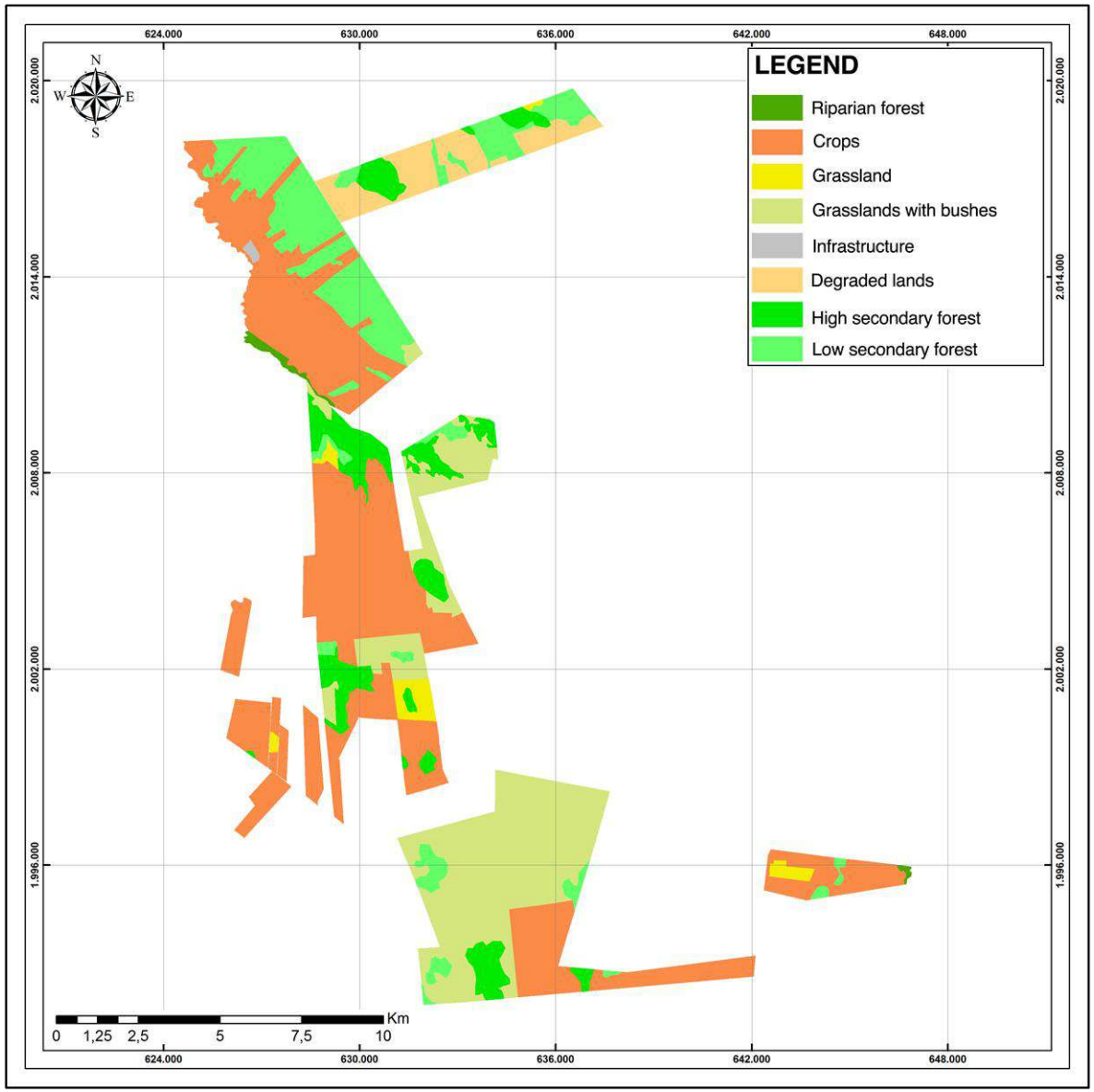


Figure 14. Land cover Northern Zone 2015

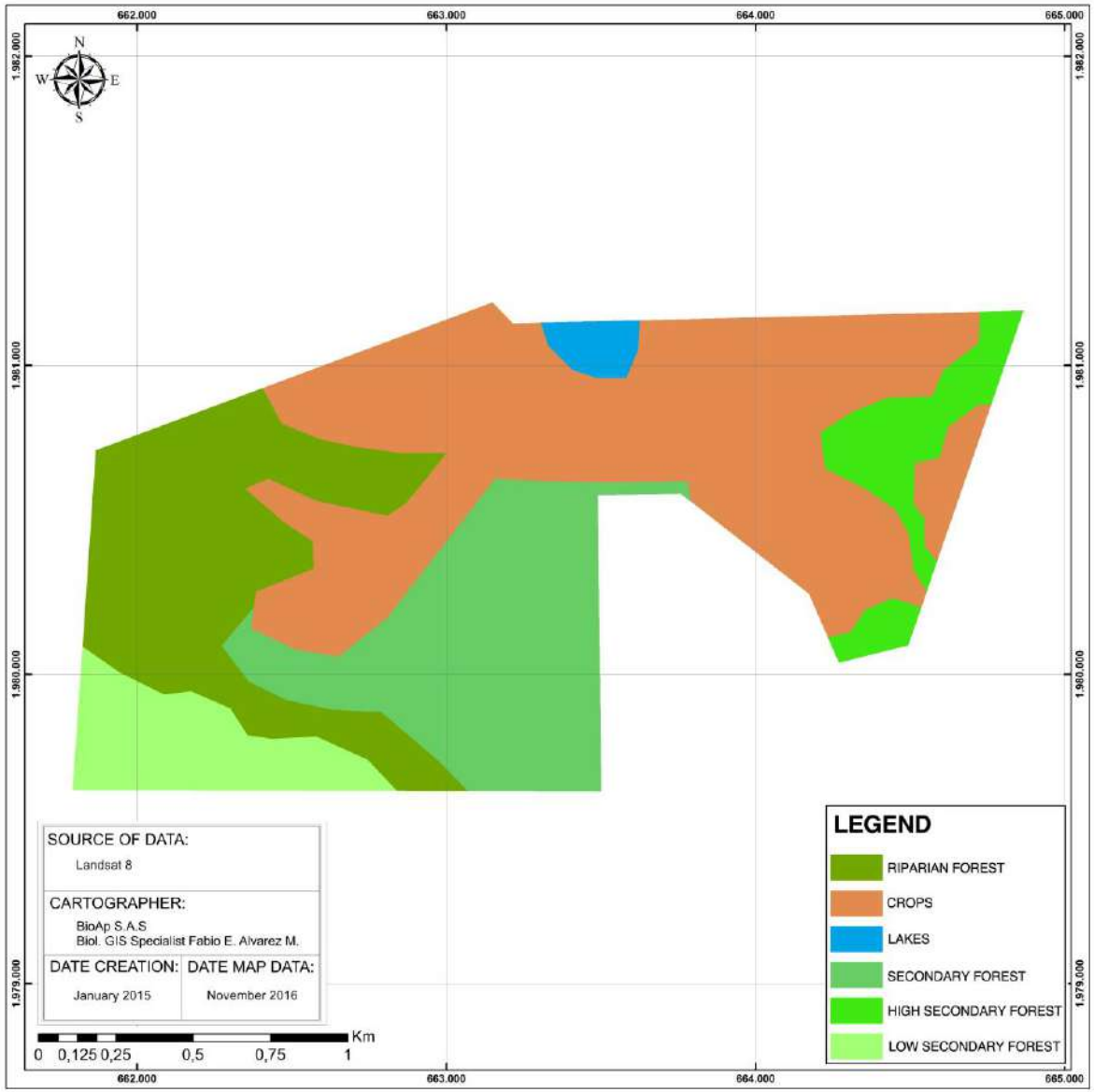


Figure 15. Land cover Eastern Zone 2005

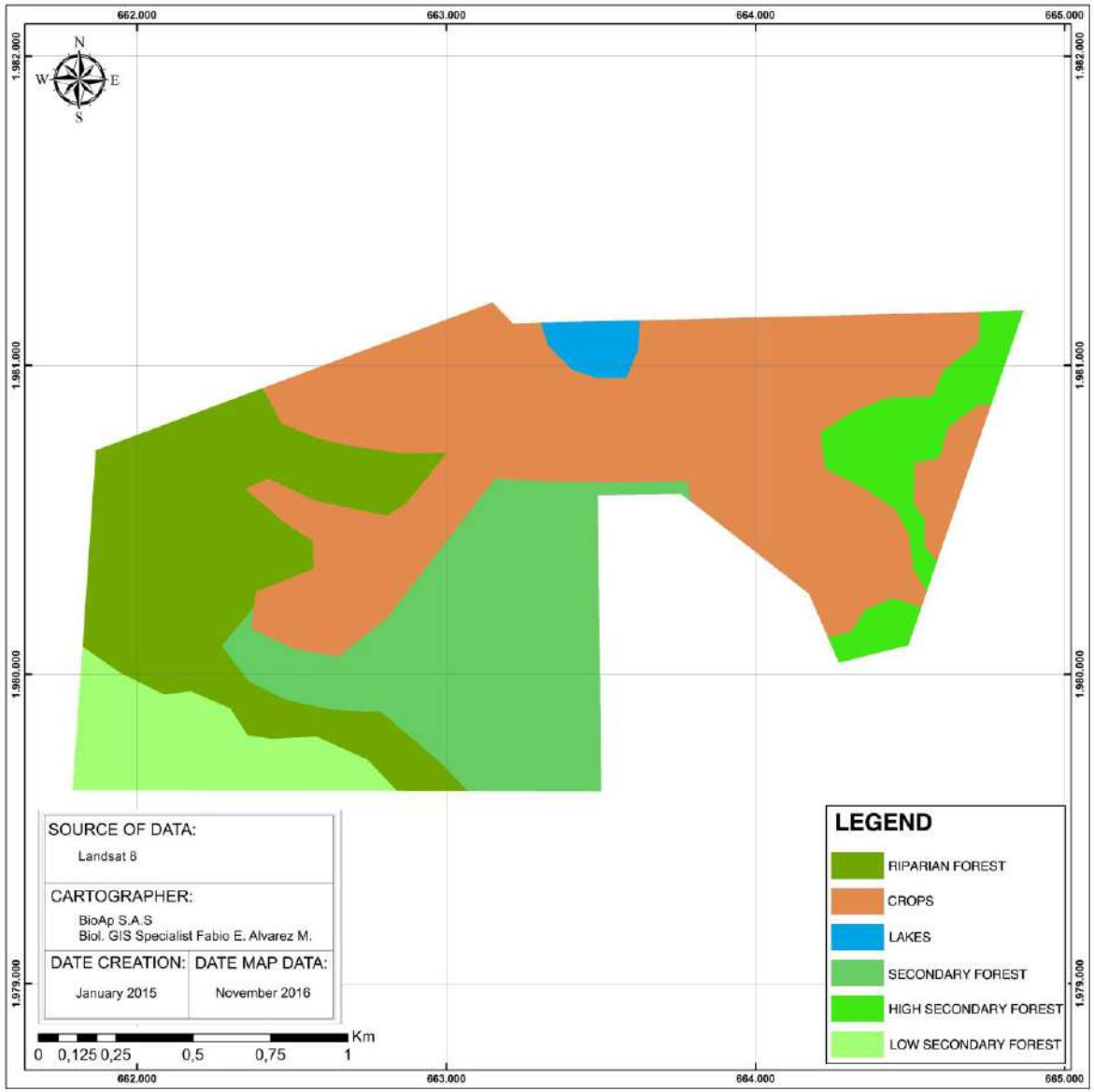


Figure 16. Land cover Eastern Zone 2007

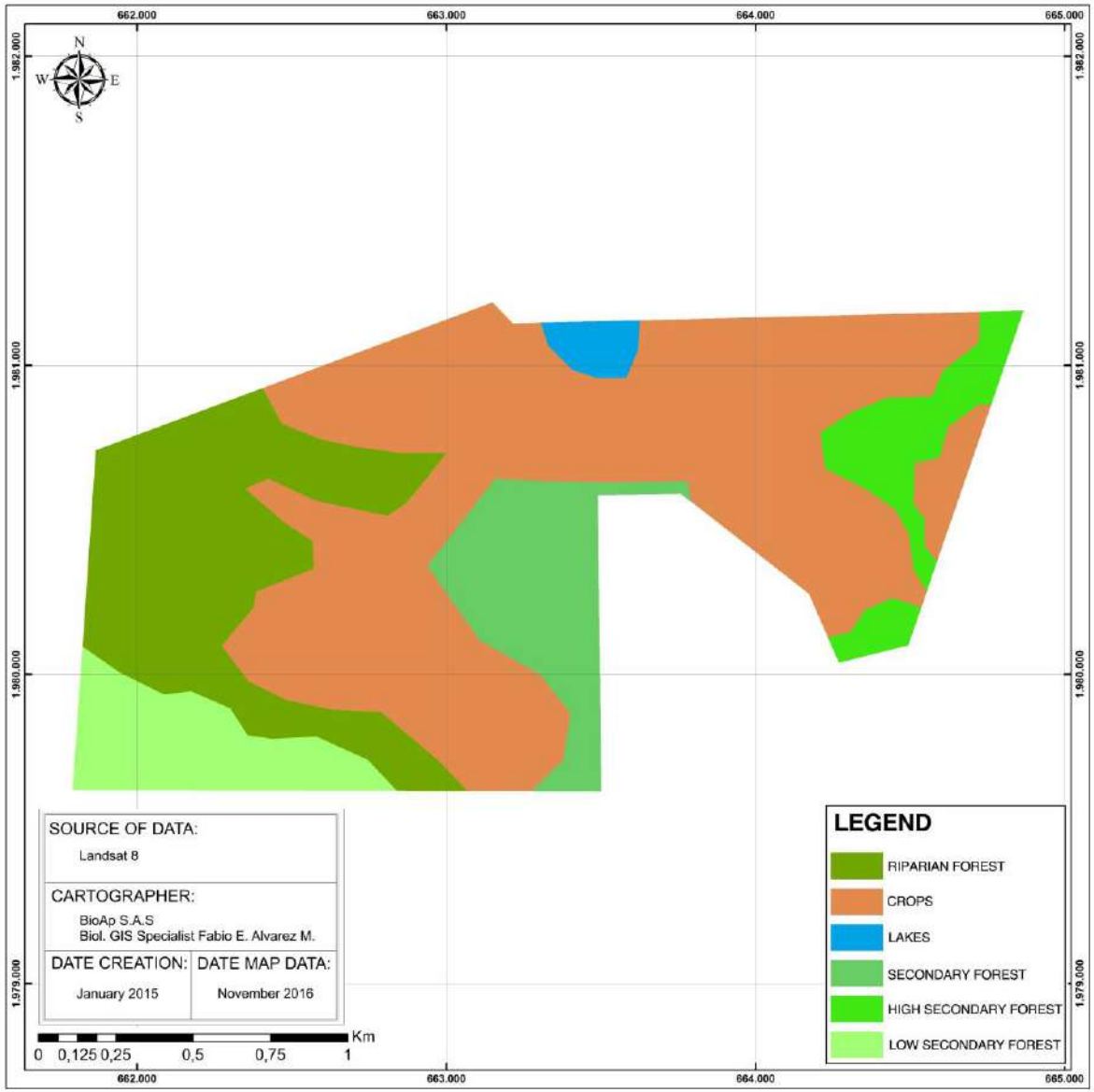


Figure 17. Land cover Eastern Zone 2009

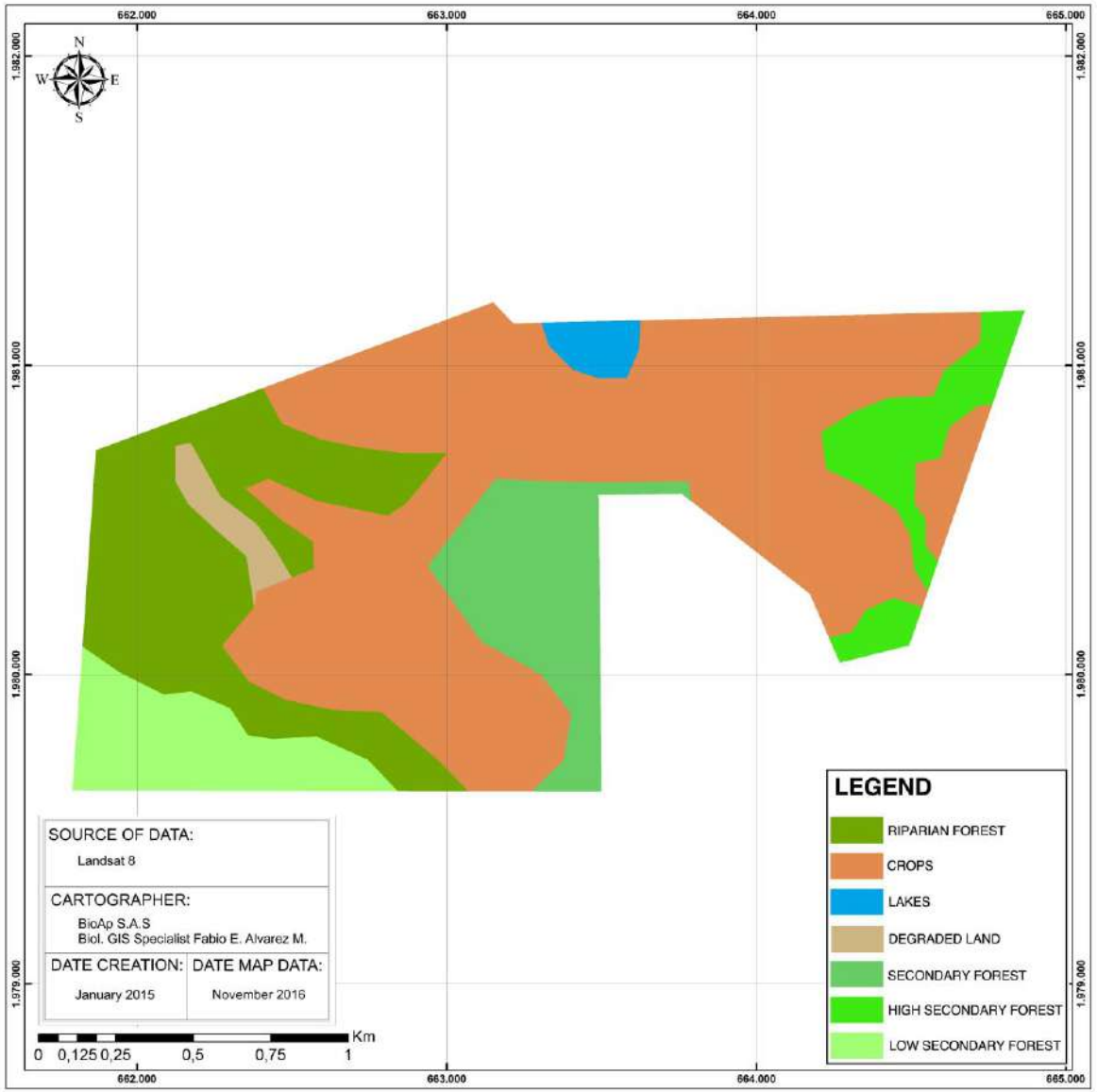


Figure 18. Land cover Eastern Zone 2015

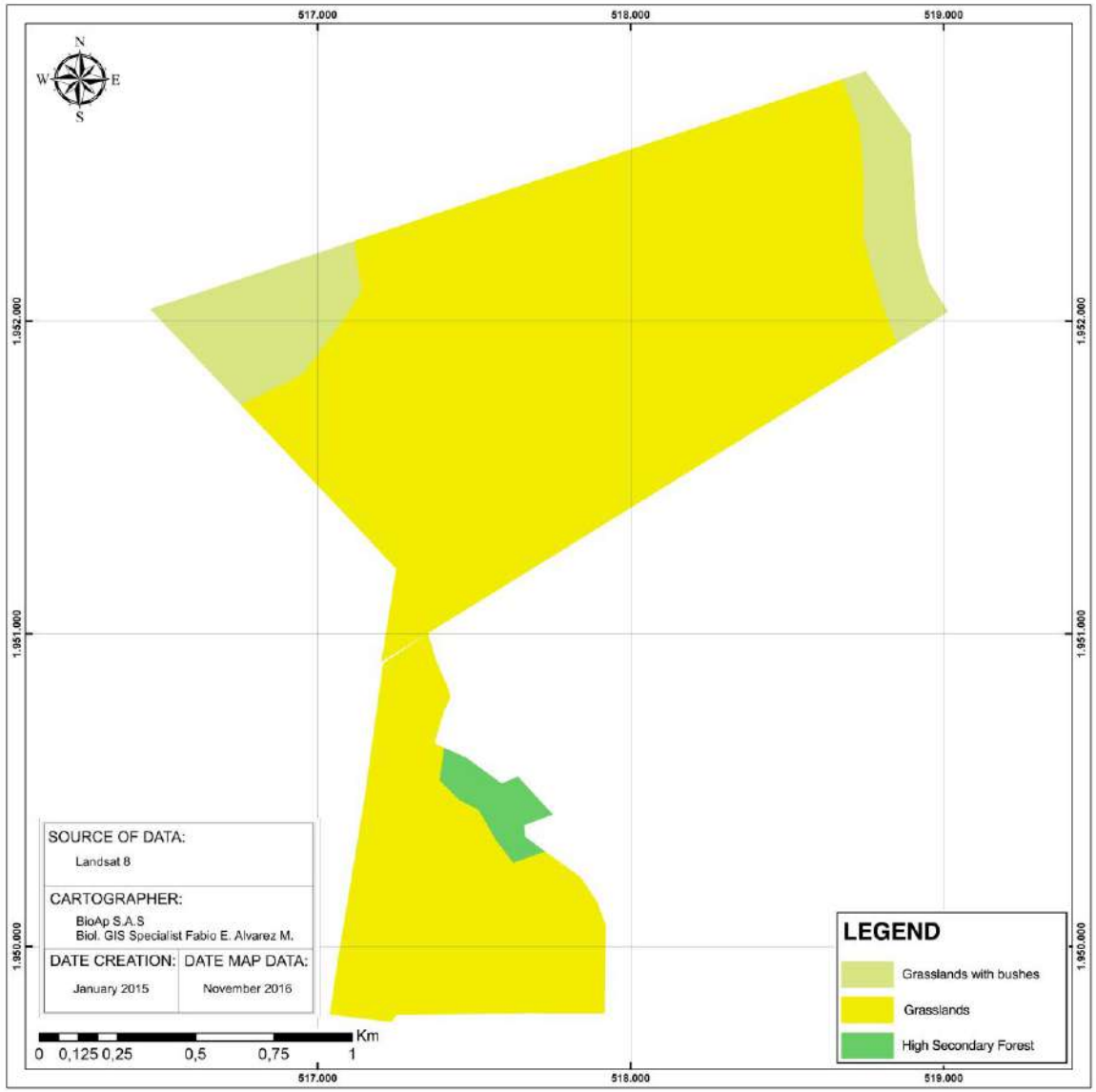


Figure 19. Land cover Western Zone 2005

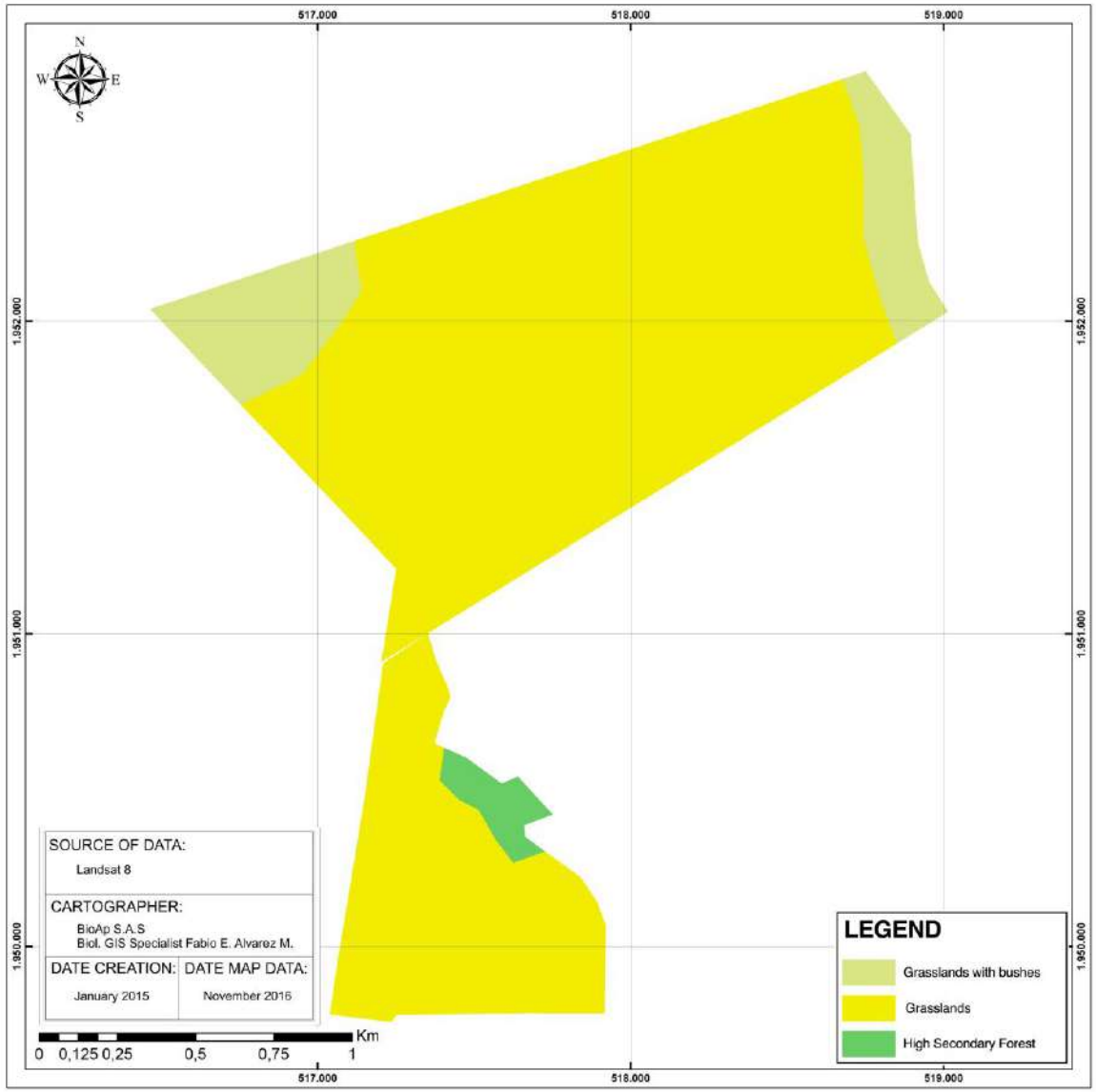


Figure 20. Land cover Western Zone 2007

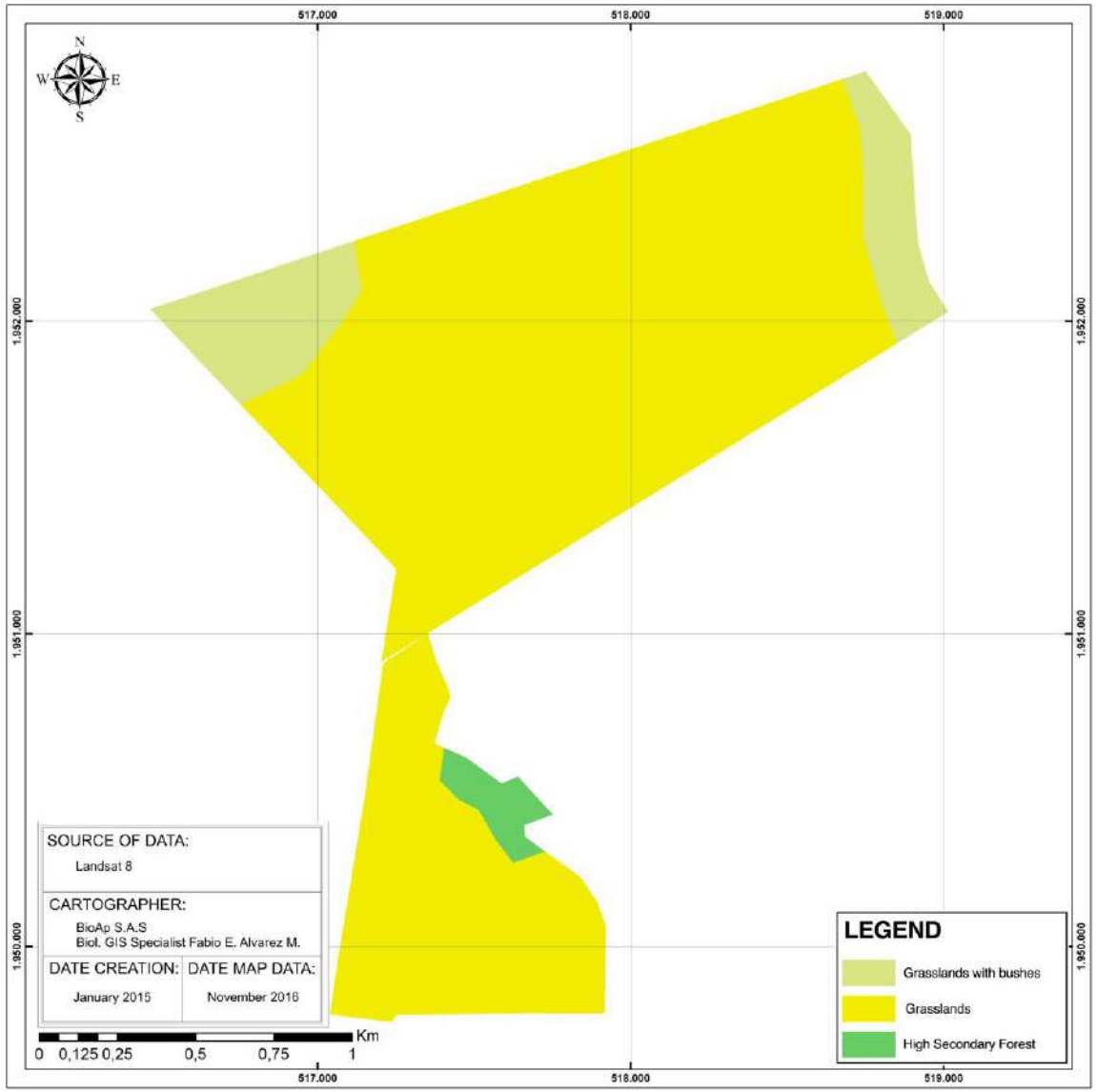


Figure 21. Land cover Western Zone 2009

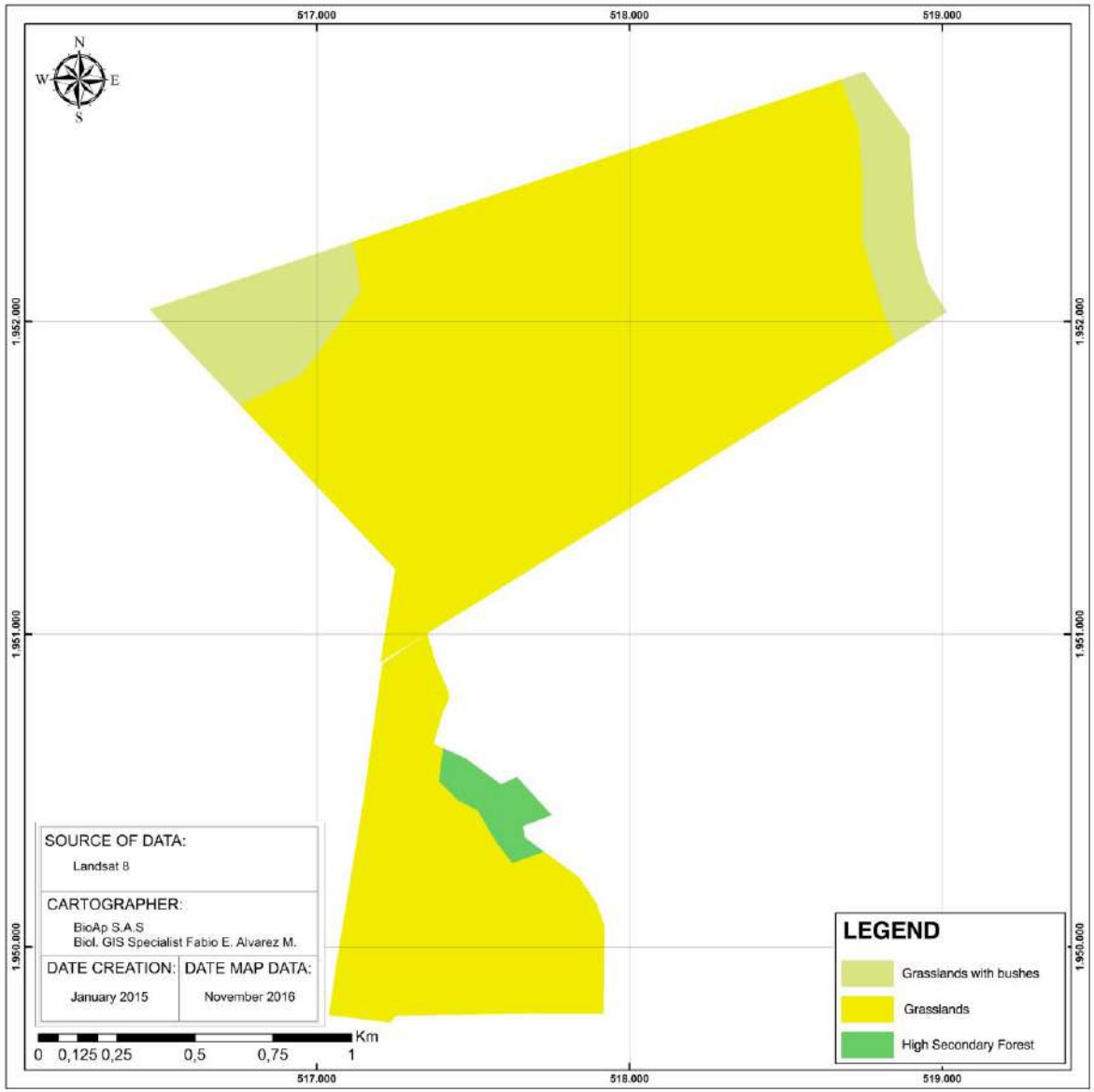


Figure 22. Land cover Western Zone 2015

2.2.2.3 Land Cover Classification Scheme (RSPO coefficients)

The RSPO (Roundtable on Sustainable Palm Oil) defined four criteria that must be used when classifying areas that have been cleared for the establishment of palm oil plantations and that are lacking previous AVC studies (Table 6).

These coefficients or categories are representative of the kind of forest/habitats and probable land usage present in the areas suitable for commercial palm oil plantations and this, in most situations, can be easily identified through the use of remote sensors.

Table 6. Vegetation Coefficient Categories RSPO

Vegetation Coefficient Categories RSPO	
Coefficient 1.0	Structurally complex forest (including primary forest), regenerating, selectively logged forest with elements of high canopy.
Coefficient 0.7	Structurally degraded but ecologically functional natural forest. Includes other degraded but still functional low-canopy secondary forest and pioneer-dominated, heavily and/or repeatedly logged or previously burned forest and regenerating forest.
Coefficient 0.4	Multi-species agroforestry.
Coefficient 0	Monoculture tree and non-tree plantations; other permanently cultivated, developed or open degraded land.

Source: BioAp S.A.S 2015

2.2.2.4 Standardization of RSPO Coefficients with vegetation cover classification (Corine Land Cover methodology)

The standardization of categories (coefficients) used by RSPO and the classification of cover (Corine Land Cover methodology), was performed in order to have greater precision when identifying and classifying cover present in the area that is being studied.

Table 7 describes the categories of vegetation cover used in Corine Land Cover methodology and its corresponding classification within the RSPO categories.

Table 7. Standardization of RSPO cover and Corine Land Cover

Coefficient	RSPO categories	Corine Land Cover
1.0	Structurally complex forest (including primary forest), regenerating, selectively logged forest with elements of high canopy	Dense forest: Cover consisting in a community of vegetation dominated by typically arboreal elements which form a more or less continuous canopy and whose cover area represents more than 70% of the total unit area, and is five meters taller than that of the canopy. These vegetal formations have not been intervened or their intervention has been selective and has not altered the original structure or functional characteristics.
		Open forest: Cover consisting of a vegetal community dominated by evenly distributed and typically arboreal elements, forming a discontinuous canopy, taller than five meters and whose area of arboreal cover represents between 30% and 70% of the total unit area. These vegetal formations have not been intervened or their intervention has been selective and has not altered the original structure or functional characteristics.
		Gallery and riparian forest: Refers to arboreal vegetation cover located along the banks of permanent or temporary watercourses. This kind of cover is limited in its scope given that it borders watercourses and natural drainage. When the presence of these forests occurs in savannas it is known as a gallery forest or *cañada*, other bands of forest along watercourses in Andean zones are known as riparian forests.
0.7	Structurally degraded but ecologically functional natural forest	Fragmented forest: comprised of territories covered by dense or open natural forest where there has been human intervention and whose horizontal continuity is affected by the inclusion of other kinds of cover such as grasses, crops or transitional vegetation, which must make up between 5% and 30% of the total unit area of the natural forest.
		Upper secondary vegetation: Are areas covered mainly by arboreal vegetation with an irregular canopy and the occasional presence of bushes, palms and vines that correspond to the intermediate stages of plant succession, after a deforestation process or forestation of grasslands. It is carried out several years after the original intervention, generally following the lower secondary stage. As time passes, tree communities of one single species or several species can be found.
0.4	Multi-species agroforestry	Agroforestry and tree crops: areas occupied by arrangements or combinations of crops made up of different species, along with other herbaceous, shrubby and arboreal species where the main characteristic of the cover is that the increased detail does not imply the subdivision of pure units because these are combined in the same area, alternating in rows of trees with crops or trees and grasses.
		Crop mosaic and natural spaces: corresponds to surfaces covered mainly by crops combined with natural spaces, where the size of the property is very small and the distribution pattern of lots is too intricate to be individually represented cartographically. In this unit, the natural spaces are shown as small patches or remnants distributed irregularly or heterogeneously, sometimes mixed in with crop areas, making them difficult to differentiate. Crop areas represent between 30% and 70% of the total unit surface. The patches
		and remains of natural spaces are made up of those areas covered by remnants of forest, scrubland, gallery and/or riparian forest, secondary or transitioning vegetation, wetlands or other areas that have not been intervened in or have been minimally changed
		and are still in their natural or almost natural state.

Coefficient	RSPO categories	Corine Land Cover
		Secondary vegetation: is made up plant cover resulting from the process of succession of natural vegetation that occurs after an intervention or by the destruction of primary vegetation, and can be in recovery of its original state. This occurs in areas cleared for different uses, in abandoned agricultural areas and in parts where the natural vegetation was destroyed by natural events. There are no elements intentionally introduced by man.
		Lower secondary vegetation: areas covered mainly by shrubs and herbaceous vegetation with an irregular canopy and the occasional presence of trees and vines, corresponding to the initial state of plant succession after a process of deforestation of forests or forestation of grasslands. Occurs after the original intervention and is generally made up of communities of shrubs and herbaceous vegetation consisting of many species.
0	Monoculture tree and non-tree plantations; other permanently cultivated, developed or open degraded land	Forest plantation: Cover consisting of arboreal vegetation plantations, created by direct human intervention for the purpose of forest management. During this process, forest stands, established through planting and/or seeding during the process of forestation or reforestation, are created for the production of timber (commercial plantations) or environmental goods and services (protecting plantations).
		Clean grasses: This cover includes land occupied by clean grasses with a cover percentage greater than 70%; management practices (cleaning, liming and/or fertilization) and the level of technology implemented
		Preclude the presence or development of other covers.
		Transitory crops: includes areas occupied by crops whose vegetative cycle is under a year, and lasting only a few months, such as cereals (corn, wheat, barley and rice), tubers (potato and yucca), oilseeds (sesame and cotton), most vegetables and some species of open air flowers. They share the basic characteristic that after harvest it is necessary to sow or plant in order to continue producing.
		Permanent crops: includes areas devoted to crops with a vegetative cycle of over a year, producing several crops without having to be replanted; this category includes herbaceous species like sugarcane, panela cane, plantain and banana; bush crops like coffee and cacao; and tree crops like African palm and fruit trees.
		Degraded or naked land: this cover corresponds to areas of land devoid of vegetation or with sparse plant cover due to both natural and anthropogenic events like erosion and extreme degradation and/or
		extreme weather conditions. This includes areas where the land is salinized as in the process of desertification or where intense erosion has occurred and can even result in the formation of gullies.
		Wooded pastures: cover includes grasslands in which pastures have been created with trees taller than five meters scattered throughout. Tree cover should be more than 30% and less than 50% of the total grass covered area.
		Grassland: cover consists of a plant community dominated by typically herbaceous elements developed naturally in different densities and substrates, forming a dense (>70% occupation) or open (30% - 70% occupation) cover. An herb is a non-lignified or barely lignified, giving all its organs a soft consistency, both underground and epigeal. These plant formations have not been intervened or their intervention has been selective and has not altered the original structure and functional

Coefficient	RSPO categories	Corine Land Cover
		characteristics.
		Urbanized areas, industrial or commercial areas, and communication networks, mining or dumping areas.

2.3 Fragile Soil Assessment

The aim of Fragile Soil Assessment is to recognize important characteristics like landing use, topography and raining regime in order to examine presence of limiting factors in order to consider the implications that may result in the adoption of certain agricultural practices. This study would help to identify areas for sowing and their specific needs.

The present Fragile Soil Assessment was conducted in January 2016.

2.3.1 Assessor's Credentials

The team crew profiles that developed the Fragile Soil Assessment are:

Name	Vocational Training	Work Experience
Juan Pablo Zorro	Biologist	Wildlife Component and Conservation Studies. Working experience on Environmental Impact and Conservation Studies for public and private sector in different areas. Experience as HCV assessor in Mexico, Ecuador and Colombia
Rodrigo Ramírez Sandoval	Biologist	Environmental Impact Studies Specialist. Working experience in development in Research Projects with emphasis on the interaction of natural resources and the alterations that are generated in the development of infrastructures.
Fabio Ernesto Alvarez	Biologist - GIS	Geographic information systems Specialist and Environmental Studies professional.

2.3.2 Methodology

The digital elevation model derived from the official website of the Instituto Nacional de Estadística y Geografía (http://www.inegi.org.mx/ INEGI) with a resolution of 15 m was used to carry out the slope analysis procedure in order to represent the terrain in as detailed as possible. This variable is highly reliable when undergoing a geomorphometric and hydrological analysis of the terrain (Jordan, 2008).

The slope is a determining factor in the analysis of land; the steepness and shape are variables that are extracted from the DEM (Digital Elevation Model) using algorithms such as Horn (Chan, K, 2004), which takes into account the influence of the eight neighboring cells to the central pixel in an array of 3x3 and employing ArcGIS. Once the slope map is obtained and classified it was reclassified in 9 classes, ranging between 0 ° and 90 °. The processing was carried out under ArcGIS system for desktop with ESRI License (Version 10.1).

The data from the DEM- Digital Elevation Model – is used to represent relief in a hydrological model (flows and connectivity), erosion (slopes, curvatures, etc.) and sedimentation zones for extracting drainage areas and topographic parameters (IGAC. 2011), as well as to obtain results for the establishment of land use.

The construction of a shadow map was carried out and was processed for base mapping after conducting survey analysis to determine inclinations. The processed DEM was digitized in order to determine the areas tilt and finally, the graphic output was built. Derek (1972) and Marsh (1979) determined standards in elevations indicating which are the reclassified slopes. This model shows that a slope greater than 25 ° is very high and therefore the planting of forest crops is problematic. Runoff or percolation are factors that may be associated with this concept. On the other hand, inclinations between 0 ° and 10 ° represent mild to moderate slopes which are optimal to develop this type of activity.

Information regarding soil types and riparian corridor data was used in the construction of the final map in order to correctly describe the terrains.

2.3.2.1 Topography

The topography is characterized by slope angles and by the length and shape thereof. Topography is an important factor in determining soil erosion, erosion control practices and possibilities for mechanized tillage. It also has a primary influence on agricultural land suitability. The greater the angle of land slope and land length, the greater level of soil erosion. An increase in the angle of the slope causes increased runoff velocity and thus, the kinetic energy of water causes more erosion. Long slopes lead to an intensification of runoff increasing its volume and causing an increasingly serious case of erosion. In addition to erosion problems, areas with steep slopes also show less potential for agricultural use. This is due to the greater difficulty or the impossibility of the use of mechanical tillage or difficulties to transport in or from the field. In these cases tillage may also be limited by the presence of surface soils.

2.3.2.2 Rain

Rain is one of the most important climatic factors influencing soil erosion. The volume and velocity of runoff depends on the intensity, duration and frequency of rain. Of these factors, the intensity is the most important and losses due to erosion increase with higher intensities of rainfall. The duration of the rainfall is a complementary factor. The frequency of rain also influences the losses caused by erosion. When rain falls in short intervals, soil moisture remains high and runoff is bulkier, even if the rain is less intense. After long periods, the soil is drier and there should not be any runoff with low intensity rain. However, in cases of drought, the vegetation may suffer due to lack of moisture and thus reduce the natural protection of the soil. During a heavy storm, dozens of raindrops are hitting every square centimeter of land, loosening the particles of the soil mass. The particles can jump 60 cm high and travel over a distance of 1.5 m. If the land does not have a vegetative cover, the drops can destroy many tons of soil per hectare that may then be subjected to surface runoff.

According to the variables presented above, the modeling of slopes and precipitation of the three zones under evaluation (Northern, Eastern and Western) is carried out in order to identify soils that may be at increased vulnerability for project implementation or that may be in the early stages of erosion induced by anthropogenic effects.

2.4 GHG Assessment

The aim of Green House Gasses Assessment is to estimate the carbon stocks in land, and to quantify the emissions coming from a specific activity.

Present GEI Assessment was conducted on January 2016.

2.4.1 Assessor's Credentials

The team crew profiles, which were the ones who developed the GEI Assessment, are:

Name	Vocational Training	Work Experience
Tatiana Ecovar Fandul	Biologist M.A in Conservation Biology	Working experience in long-term sustainability in productive landscapes, with a great understanding of the agricultural and productive dynamics in Latin America.
Diego A. Rodriguez	Biologist – Botany	Specialist in Botany. Working experience on Environmental Impact and Conservation Studies for public and private sector in different areas. Experience as HCV assessor in Mexico, Ecuador and Colombia.
Rodrigo Ramírez Sandoval	Biologist	Environmental Impact Studies Specialist. Working experience in development in Research Projects with emphasis on the interaction of natural resources and the alterations that are generated in the development of infrastructures.
Fabio Ernesto Alvarez	Biologist – GIS	Geographic information systems Specialist and Environmental Studies professional.
Camilo Valencia	Forestry Engineer	Working experience on forest inventories and ecosystem characterization for public and private sector.
Maria Juliana Díaz Rojas	Biologist	Working experience on mining projects in Environmental Impact Studies within Llanos and Amazon colombian regions.

2.4.2 Methodology

2.4.2.1 Visual Interpretation

For the analysis of coverage and biomass estimations, satellite images and vector official information on coverage from the digital resources of the National Institute of Statistics and Geography (INEGI from its initials in Spanish) were included using desktop ArcGIS with ESRI license (Version 10.1), Quantum GIS (QGIS desktop version 2.12.1) and ERDAS IMAGINE.

The satellite images are one of the most accurate information resources to obtain precise results leading to correct decision-making. Here, images from LANDSAT 8 were used as the main analysis resource to corroborate and update coverage. This process was developed under visual interpretation method and bands mapping. The method was divided in two parts i) interpretation and verification, and ii) analysis and verification.

2.4.2.1.1 Part 1. Interpretation and verification

To interpret the management area with LANDSAT 8 images from 2015, with a 30m resolution for the OLI (*Operational Land Imager*) bands 1-7; similarly, panchromatic 8 OLI bands were used with 15m resolution for capacity adjust. The bands were compiled in a single image and were structured in a mosaic over the general management area. For the interpretation, bands were combined to determine the type of coverage and their status, based on coverage vector data and land use information from INEGI. Coverage was also corroborated in the field, were landforms, structures, and constructions were recorded and geo-referenced.

2.4.2.1.2 Part 2. Analysis and digitalization

All information was organized and analyzed together firstly by visual interpretation of images, and overlapping the coverage verification points and the land use shape. The process was developed using band combinations. Table 8 shows the spectral bands used by LANDSAT 8 sensor. For the interpretation, 4,3,2 combinations of natural color were used, with 5,4,3 for infrared of vegetation state and 6,5,2 for the analysis of crops and soil humidity.

Table 8 Spectral bands description included in the LANDAT 8 sensor

	Bandas	longitud de onda (micrómetros)	Resolución (metros)
Landsat 8 Operational Land Imager (OLI) and Thermal Infrared Sensor (TIRS)	Banda 1 - Aerosol costero	0.43 - 0.45	30
	Banda 2 - Azul	0.45 - 0.51	30
	Banda 3 - Verde	0.53 - 0.59	30
	Banda 4 - Rojo	0.64 - 0.67	30
	Banda5 – Infrarrojo cercano (NIR)	0.85 - 0.88	30
	Banda 6 - SWIR 1	1.57 - 1.65	30
	Banda 7 - SWIR 2	2.11 - 2.29	30
	Banda 8 - Pancromático	0.50 - 0.68	15
	Banda 9 - Cirrus	1.36 - 1.38	30
February 11, 2013	*Banda 10 – Infrarrojo térmico (TIRS) 1	10.60 - 11.19	100
	*Banda 11 - Infrarrojo térmico (TIRS) 2	11.50 - 12.51	100

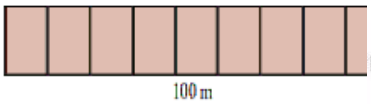
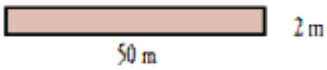
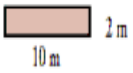
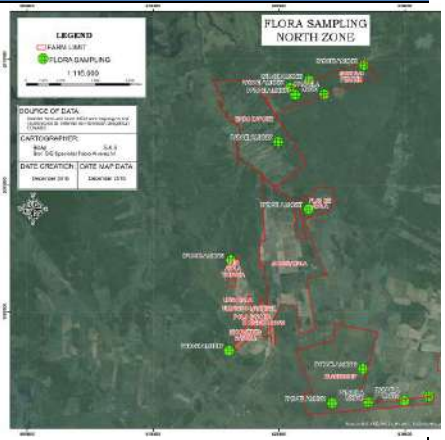
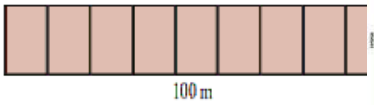
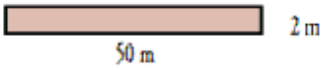
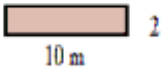
Source: Landsat, 2013

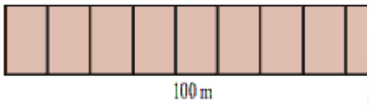
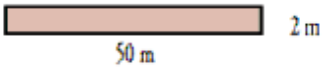
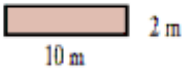
Finally, the vector layer was digitalized by land and the area value by coverage. All process was developed in a geographic database.

2.4.2.2 Collection of base information

Following Table 9 describes the techniques used to collect base information on the field phase:

Table 9 Procedures for GHG Assessment during field phase

STUDY AREA	METODOLOGY	NUMBER OF PLOTS	LOCATION
NORTHERN ZONE	Initially, a physiognomic description of vegetation cover was made. Description indicates aspects such as forest height, epiphytism degree, presence of lianas and characteristics of undergrowth. Subsequently, a plot of 100 m x 10 m, divided every 10 m, was demarcated for a total sampled area of 0.1 hectares (1000 m2); Then we recorded information of all individuals whose diameter at breast height (DAP) was greater than or equal to 10 cm. Information included: growth habit (bush, tree, liana) and commercial height, height, stem diameter, cup diameter, use and local names. The basic sampling unit (0.1 ha) chosen in each forest cover survey allows a broad comparison with other works carried out in different areas of Mexico, also facilitates a greater number of surveys in a short time, allowing to be obtained a representative sample. Another advantage of choosing this basic sampling unit (0.1 ha) is to reduce the risk of including several types of coverage within the same plot (Cárdenas, et al 1997). Foristic diversity of tree	14 plots of forest of 10 m x 100 m.  100 m 7 plots of shrubs and bushes of 2 m x 50 m.  2 m 50 m 3 plots of grasslands of 2 m x 10 m.  2 m 10 m	
WESTERN ZONE		7 plots of forest of 10 m x 100 m.  100 m 3 plots of shrubs and bushes of 2 m x 50 m.  2 m 50 m 2 plots of grasslands of 2 m x 10 m.  2 m 10 m	

STUDY AREA	METODOLOGY	NUMBER OF PLOTS	LOCATION
EASTERN ZONE	layer was evaluated using biodiversity indices such as Shannon (H), (Odum, 1983), and Importance Value Index (IVI) for each specie. Also, total height, basal area, diameter distribution and respective volumes were calculated. According to developed by Cárdenas and collaborators (2004), height of canopy was determined based on the average of 15% of the highest individuals in each plot, excluding emerging ones. The height of each plot was then averaged, then the heights within each Ecosystem Unit were averaged. Finally, three categories were defined: High Forest> 20 m, Medium Forest between 10 and 20 m and Low Forest <10 m. Coverage was defined according to FAO (1990): Dense Forests> 70%, Semi-Indigenous Forests between 40% - 70% and Open Forests between 10 - 40%. For the characterization of the savannas, plots of 2 m x 50 m were demarcated. The aim was to record every non-graminiform individuals up to 1.5 m tall present within scrubland coverage. Likewise for the characterization of coverages with shrubs, plots of 2 m x 50 m were demarcated, where all individuals of shrubs between 1.5 m - 4 m in height were recorded. On the other hand, for the evaluation of the open	5 plots of forest of 10 m x100 m.  3 plots of shrubs and bushes of 2 mx 50 m.  2 plots of grasslands of 2 mx 10 m.  	

STUDY AREA	METODOLOGY	NUMBER OF PLOTS	LOCATION
	savannas, plots of 2 m x 10 m were demarcated, where all individuals with graminiform appearance (Herbaceous) were registered.		

2.4.2.3 Carbon stock estimation

Carbon stock estimation (tonnes carbon per hectare tC/ha) was calculated taking into account the last version of RSPO GHG Assessment Procedure for New Plantings Version 3, 30th October 2016[1].

Land cover classification resulting from visual interpretation and field verification where made implied the acquisition and pre-processing of satellite images, and land cover verification during field phase. Then land covers where made compatible with RSPO default land cover classes.

2.5 HCV Assessment

The aim of High Conservation Values Assessment is to identify the environmental and social aspects that are significant or critical in the context of forest certification. Every HCV requires an specific management and monitoring process.

Present HCV was conducted from August to December 2015.

2.5.1 Assessor's Credentials

The team crew profiles, which were the ones who developed the HCV Assessment in the field phase, are:

Name	Vocational Training	Work Experience
Juan Pablo Zorro	Biologist	Wildlife Component and Conservation Studies. Working experience on Environmental Impact and Conservation Studies for public and private sector in different areas. Experience as HCV assessor in Mexico, Ecuador and Colombia
Diego Rodríguez Torres	Biologist - Botany	Specialist in Botany. Working experience on Environmental Impact and Conservation Studies for public and private sector in different areas. Experience as HCV assessor in Mexico, Ecuador and Colombia.
Tatiana Escobar	Biologist M.A in Conservation	Working experience in long-term sustainability in productive landscapes, with a great understanding of the agricultural and productive dynamics in Latin America.

[1] http://www.rspo.org/certification/ghg-assessment-procedure

Name	Vocational Training	Work Experience
	Biology	
Rodrigo Ramírez Sandoval	Biologist	Environmental Impact Studies Specialist. Working experience in development in Research Projects with emphasis on the interaction of natural resources and the alterations that are generated in the development of infrastructures.
Fabio Ernesto Alvarez	Biologist - GIS	Geographic information systems Specialist and Environmental Studies professional.
Nathaly Ruiz	Sociologist	Environmental Impact Studies and Social field methods

2.5.2 Methodology

Table 10 describes developed activities and the HCV actions development dates are shown for Palmicultores de San Nicolas enterprise.

Table 10.HCV´s Chronology developed for the assessment

Main Activity	Secondary activities	Description	Starting – Ending Dates
Company contact	Initial meeting	Research scope, initial information about company´s requirements, BioAp´s employees introduction	08/04/15 – 08/04/15
	Budget request	Preliminary budget and methodology request	08/10/15 – 08/10/15
Information supply	Georeferenced estates in order to be evaluated	Estates which were evaluated during the research were verified	08/13/15 – 08/23/15
Level description	Risk and impact indicators review.	Depending on the project´s scope and its HCV qualification procedure manual, the research level was determined.	08/20/15 08/23/15
Baseline information compilation	Evaluated areas base line information and previous research were requested.	Baseline research such as SEIS and HCV were obtained and environmental information was searched using national databases such as INEGI and CONABIO.	08/13/15 – 09/11/15
Research main scope	Company members query	Sustainability Department Manager and Agronomic Manager	08/15/15 – 09/01/15
Planning and	Key objectives	Methodology to compile and	09/01/15 –

Main Activity	Secondary activities	Description	Starting – Ending Dates
preparation	definitions in order to get the field phase and final assessment	analyze crucial information about the social and environmental components	09/10/15
Identification de HCV	Field work	Vegetal hedge verification	11/09/15 - 25/10/15
		Local communities consultation	
		Company´s employees consultations	
		Entities consultation,	
		Fast ecological assessment	09/22/15 – 10/15/15
	Office work	Secondary information analysis	09/22/15 – 10/25/15
		From the obtained field work data, social and environmental information was analyzed	
Analysis and recommendations	HCV and AMHCV mapping build-up	From the primary and secondary information HCV and AMHCV were defined.	10/25/15 - 11/15/15
	Management recommendations build-up		
Report elaboration	Research context elaboration	Starting from the HCVN recommendations, the final document was elaborated	12/03/15 – 01/03/16
	Mapping context build-up		
	Final report unification		
	Inspection contact		

2.5.2.1 Interested parties consultation

Consultations were developed during all research stages and the preparation of this document. Table 11 shows a summary of the consultation parties, dates, places, objectives and recommendations which were obtained in the consultation. Agricultural and environmental managers, rural leaders and community's action councils were consulted including environmental leaders from the government.

Table 11. Summary of key issues raised by the interested parties

Name	Consultation date	Key matters and recommendations
Biologist. Jorge Eduardo Hernández.	September 18th 2015	Concerns about biological corridors interruption coming from the palm oil plantations area are shown. On the other hand, huge impacts to Tamandua populations are cited.

Name	Consultation date	Key matters and recommendations
Protected Areas National Commission		Generally the company´s manager proposed the following management recommendations: - Properly marked conservation areas - Respect for biological corridors. - Maintain affluent protection boarders - Protect eyes water and water corridors. - Conservation programs to be implemented in the areas should focus on specific topics such as Laguna de Terminos and species as *Alouata pigra*, *Alouata paliata*, *Ara macao* and some other species included as risk categories.
José Cruz Benítez		People who rePresentd the council gave their point of view regarding palm plantation in the municipality, pointing negative aspects about palm oil activity, mainly related to water sources contamination. Key recommendation were given: -Check that the sowing estates must not be found inside Laguna de Terminos´ area. - Protection of water resources inside the plantations areas. - Tinto Rojo, Tinto Blanco, Caoba y Cedar species reforestation plan implementation. -Management measures implementation to prevent contamination from the Laguna de Terminos which is a protected area.
José Carballo		
Academic personal and directives from the Universidad Tecnológica del Usumacinta (UTU): Mari Carmen Bravo	September 15th 2015	UTU expresses its avaliability to perform coperation programs between the company and the univerity in order to get better palm oil agricultural practices and contribute to crop´s sustainability.
Manuela Cambranes		
Gabriel Torres		
Cipirón García		
Municipal field Secretaryship: Luis R.C.	September 16th 2015	A brief contextualization by the official about how land usage has been transformed in recent years. The agricultural and livestock vocation of the area is demonstrated. No recommendation was made by the official about the area´s environmental management.

Name	Consultation date	Key matters and recommendations
Universidad Autónoma de Chiapas (UNACH) directives	September 18th 2015	UNACH directives expresses concerns about negative impacts that could be brought by monocultures implementation because this will help to the disappearance of other species which are essential region´s inhabitants´ diet. Last but not lEastern, the directives expresses its interest to increase efforts and carry out joint actions to get integral professionals that contribute to the environmental, social and economic development of the region.
Habitantes Ejido Playa Larga	September 13th 2015	Participants manifest the ecological and economic importance of Laguna de Terminos as it is the main fishing region´s area. The main recommendation after the meeting is to control water runoff and affluent management Presentd in sowing areas, since they are directly connected to the Lagoon. From consultation activities, wildlife and flora species were listed thanks to participatory consultations activities which later were included in some of the HCVs.
Palmicultores de San Nicolás employees	September 14th del 2015	Positive and negative aspects related to cultivation activities are identified by field employees. Soil, water, wildlife and flora are the main threats described. Additionally, wildlife and flora species were listed and included in the HCVs. Using the information form this exercise some recommendations are given: - Perform a proper management of water discharges to the affluents. - Perform controlled fumigation activities - Trees plantation around the plantation - Safeguarding forest fragments to protect native animals. - Hunting and fishing prohibition within the planting área - Forbid fires. - Conduct environmental training - Proper waste management.
Farmer and land owner: Jorge Atilano Ayala.	September 14th 2015	The farmer shows interest about being part of the sustainable palm project, he gives information about the organic cultivation practices he performs like the use of organic pesticides and fertilizers which are not or little invasive. As the information given shows about the farm, there is an on-going reforestation program using red tree species.
Municipalities President and City hall representatives	September 15th 2015	At the meating was suggested that the company should invest in environmental and social issues, in order to promote belonging sense with is employees and environmental preservation.

Name	Consultation date	Key matters and recommendations
Leaders from the municipalities´ common land usage (Zapote and Tumbo de la Montaña)	September 16th 2015	Leaders have misperceptions about biodiversity. They said that it could bring pests and diseases. The information given, rises recomendations about performing a strong environmental education program to the people and leaders form the land of common usage.
People form the land of common usage Zapote y Tumbo de la Montaña	September 16th 2015	In this meating some of the HCV`s wildlife and flora which were previously incorporated. Problems due to deforestation and wrong agricultural practices that led to find only small portions of forest and weeded pastures. They showed concerns about aereal aspertion techniques, due to water and native wildlife and flora contamination proseses.
People form the land of common usage (Montaña)	September 18th 2015	Bad perceptions about agricultural cultivation are identified in the meating, due to a large environmental affectation generated by the banana plantations in the area. In this meating, wildlife and flora were identified and included to the HCV. An environmental education program is remmended to this community.

Source: BioAp S.A.S 2015

2.5.2.2 Participatory mapping

Participatory mapping is a tool from which participants will be able to draw their environment, taking into account important elements that will guide to ensure activities development in order to have solid information in terms of productivity axes. In HCV terms, this maps were used both for a socio-economic characterization of the region and its inhabitants, and for the identification of potential HCVs.

2.5.2.3 Surveys and interviews to assess HCV 5 y 6

Surveys and semi-structured interviews to inhabitants of the communities which belong to the project`s area of influence were performed. The interviews were aimed to obtain information related to the local perception about biological resources usage and management, and also about recent landscape transformation. The interviews also helped to compile information regarding resent history from the area of influence.

2.5.2.4 Quick Ecologycal Evaluation (QEE)

During September and October 2015 wildlife and flora inventories were developed in different natural environments. The areas that made part of the inventories are the ones who present better conditions and also different land covers in each estate. In total, 13 flora-sampling stations were taken into account and 8 for wildlife.

Table 12 summarizes field sampling techniques used for primary collection for each group.

Table 12. Biological information sampling methodology by direct collection

Taxa	Sampling Technique	Time/area	Reference
Vascular plants	**Arboreal strata**	13 plots (8000 m2) Rout: 7 days.	Catie 1998
	Trees inventory (DAP ≥ 5cm) with plots of 100 x 10m in the tree cover at the zones with better coservation condition. Botanical samples collection to get the taxonomic characterization.		
	Herbaceous stratum, epiphytes and palms		
	General species identification tours, botanical collection y photographic records.		
Amphibians and Reptiles	200m linear transects records sampling 5 hours/day, from 6 am – 8 am and 6 pm – 9 pm.	14 days and 7 transects	Crump & Scott (1994) Heyer et al. 1994, Smith y Taylor (1966) y Casas y McCoy (1979)
	Daytime and night observation tours (VES) for the correct sighting of this group. Individuals were captures for their respective determination and subsequent reléase.		
Birds	Observation tours using binoculars and cameras with telephoto lenses of 300 mm.	14 days y 6 nets, 7 points	Villa Real *et al.* 2004 Howell y Webb (1995), y Peterson y Chalif (1989).
	Mist nets. Individuals were capture for their description, photographic record and immediate release. During 5:30 am to 10 am and 4 pm to 6 pm.		
Mammals	Structured surveys to identify large mammals with cultural, economic and ceremonial importance.	13 days, 5 Tomahawk traps, & Mistnets.	Torres et al. 2004 Emmons 1997 Linares 1998, Alvarez *et al*. (1994), Emmons y Feer (1990), Hall (1981) y Medellín (1992).
	Tomahawk traps (40.5 x 13 cm) placed in different hábitats which are part of the estates. The traps were baited with tuna and sardines.		
	Mistnets: Six mistnets were located in strategyc places such as: riverbeds and streams, edges and interiors of different types of vegetation.		
	Trailmarks, axes, claw marks among others were searched to get identification of species.		
	Observation daytime tours in forest, grasslands, water bodies among others areas.		

Source: BioAp S.A.S 2015

3. SUMMARY OF FINDINGS

3.1 SEIA Findings and Results

Table 13.SEIA Findings and Results

Component	Media	Impacts	ZONES		
			Northern	Western	Eastern
			Environmental Classification (EC)		
ABIOTIC	AIR	Air quality changes	(EC): -100 Moderate	(EC): -101 Moderate	(EC): -104 Moderate
		Noise level changes	(EC): -129 Significant	(EC): -113 Significant	(EC): -117 Significant
	SOIL	Soil quality changes	(EC): -149 Significant	(EC): -148 Significant	(EC): -148 Significant
		Land use change	(EC): -118 Moderate	(EC): -122 Moderate	(EC): -122 Moderate
	WATER	Surface water quality changes	(EC): -212 Severe	(EC): -185 Severe	(EC): -185 Severe
		Riverbed alteration	(EC): -84 Moderate	(EC): -81 Moderate	(EC): -77 Moderate
		Phreatic level alteration	(EC): -136 Significant	(EC): -139 Significant	(EC): -143 Significant
BIOTICO	FAUNA	Fauna loss	(EC): -118 Moderate	(EC): -135 Moderate	(EC): -139 Moderate
		Habitat fragmentation and biological corridors loss	(EC): -93 Moderate	(EC): -94 Moderate	(EC): -113 Moderate
		Water bodies affectation (icthyofauna, benthic and planktonic communities)	(EC): -182 Severe	(EC): -190 Severe	(EC): -178 Severe
		Endemic, endangered, and ecological/economic/cultural important species affectation	(EC): -122 Significant	(EC): -118 Significant	(EC): -165 Significant
	FLORA	Vegetation cover loss	(EC): -122 Significant	(EC): -123 Significant	(EC): -125 Significant
		Habitat fragmentation	(EC): -103 Moderate	(EC): -100 Moderate	(EC): -109 Moderate
		Landscape affectation	(EC): -89 Moderate	(EC): -126 Moderate	(EC): -126 Moderate
		Endemic, endangered, and ecological/economic/cultural important species affectation	(EC): -119 Moderate	(EC): -116 Moderate	(EC): -133 Moderate

Component	Media	Impacts	ZONES		
			Northern	Western	Eastern
			Environmental Classification (EC)		
SOCIO ECONOMICO Y CULTURAL	INFRASTRUCTURE	Existing infrastructure affectation and utility network	(EC): -154 Significant	(EC): -167 Significant	(EC): -173 Significant
		Mobility changes	(EC): -158 Significant	(EC): -162 Significant	(EC): -162 Significant
		Supply of and demand for labour and utility network	(EC): 208 Highly Beneficial	(EC): 208 Highly Beneficial	(EC): 208 Highly Beneficial
	SOCIAL	Generation of accident hazards	(EC): -140 Significant	(EC): -134 Significant	(EC): -138 Significant
		Generating expectations	(EC): -188 Severe	(EC): -186 Severe	(EC): -186 Severe

Source**: BioAp S.A.S 2015**

3.1.1 Abiotic Zoning Results

3.1.1.1 Northern zone

For the abiotic components, exclusion areas are those where water rounds come from reservoirs that intersect with areas of direct and indirect influence of the plantation estates. In the same way all the areas that have had no previous intervention or change in land use are defined as conservation areas and of fundamental infrastructure, such as primary irrigation channels and hydroelectric plants.

Specifically the main irrigation system has been set at 20 m wide on each bank, and in the case of secondary irrigation lines there is a 10 meter buffer on each bank for the purpose of operational implementation of activities.

The 13 plantation areas are established as areas of restricted intervention and special management measures: Areas intervened in recovery process, marshes, ponds, main irrigation system pumps and secondary channels.

The project's areas of greater interest are the areas of intervention with environmental management. All areas suitable for agriculture and forestry handling, water reservoir irrigation system, airports and bridges were identified.

The Environmental Management Zoning map for the northern zone of the abiotic component is shown in Figure 23.

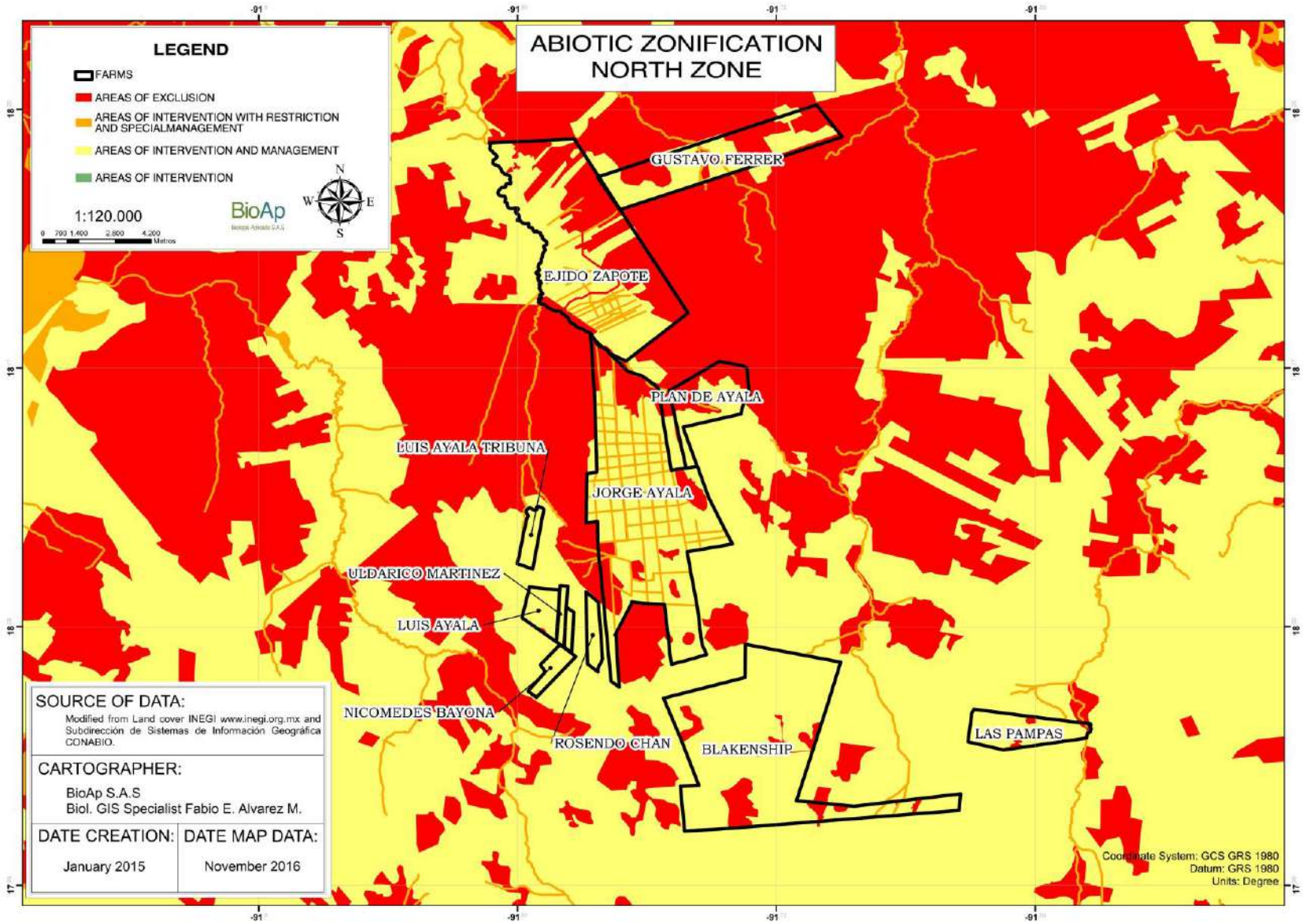


Figure 23. Northern Zone Abiotic environmental zoning

3.1.1.2 Western zone

Areas of exclusion for the abiotic component are defined as areas of ecological, floristic and physiognomy, conservation priority.

As far as the 2 plantation zones, restricted areas of intervention and special management are established taking into account rivers and streams because of the importance and sensitivity they generate as nonrenewable natural resources of social and agricultural use.

The project's major areas of interest are the areas of intervention with environmental management. They have all been identified as suitable for agriculture, livestock and forestry, which allows for the sustainable development and the establishment of monocultures, without increasing the existing agricultural lands.

The Environmental Management Zoning map for the western zone of the abiotic component is shown in Figure 24.

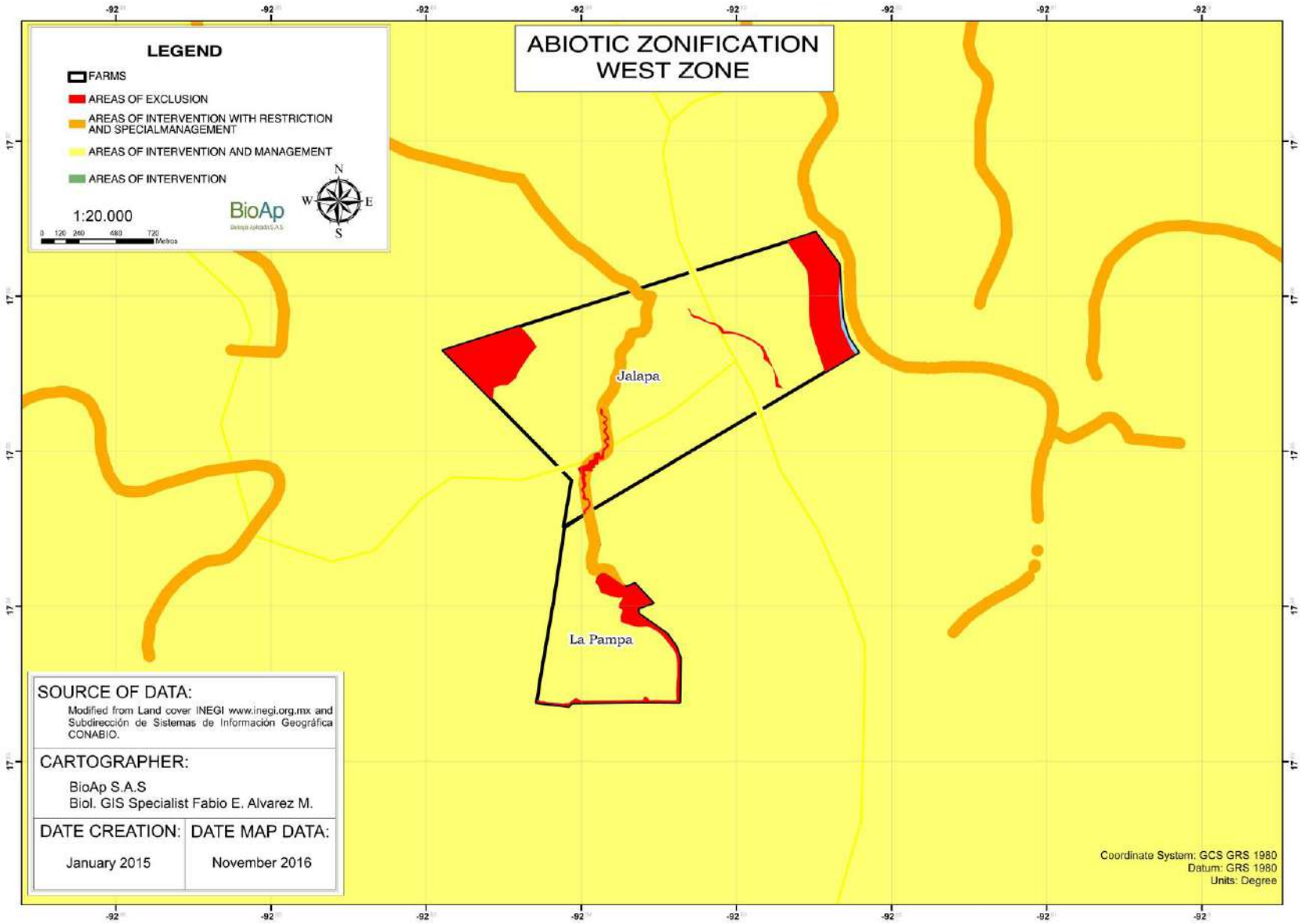


Figure 24. Western Zone Abiotic environmental zoning

3.1.1.3 Eastern zon

Areas of exclusion for the abiotic component are defined as areas of ecological, floristic and physiognomy, and have conservation priority given its ecological importance and resilience.

In these plantation zones, restricted areas of intervention and special management are established taking rivers and streams into account, because of the importance and sensitivity they generate as nonrenewable natural resources of social and agricultural use.

The project's major areas of interest are the areas of intervention with environmental management. They have all been identified as suitable for agriculture, livestock and forestry, which allows for the sustainable development and the establishment of monocultures, without increasing the existing agricultural lands.

The Environmental Management Zoning map for the eastern zone of the abiotic component is shown in Figure 25.

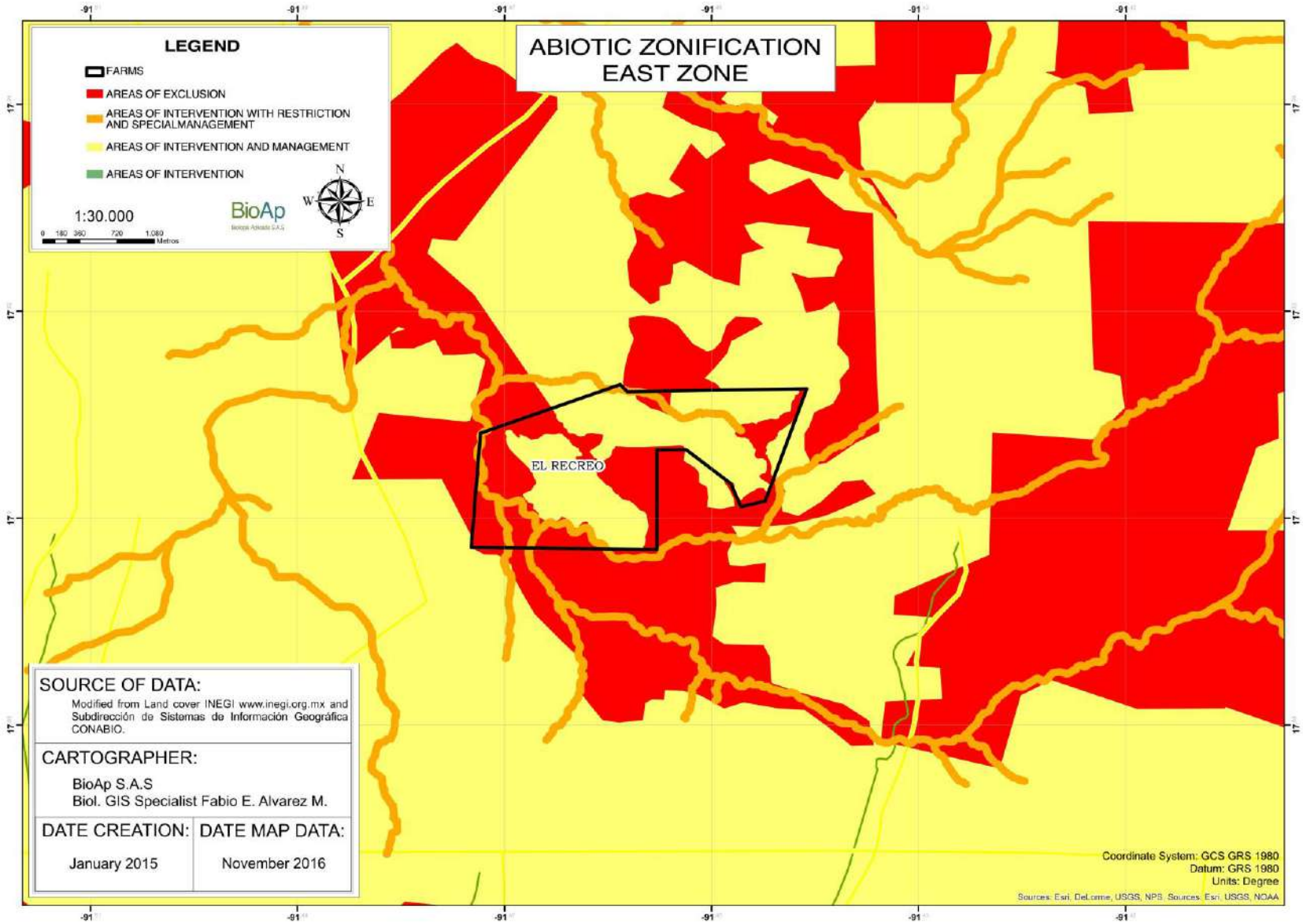


Figure 25. Eastern Zone Abiotic environmental zoning

3.1.2 Biotic Zonig Zones

3.1.2.1 Northern zone

Areas of exclusion of the biotic component are seen as areas with the following vegetation covers: Evergreen Forests, Spinous Vegetation Forests, Oak Forests and Hydrophilic Vegetation, of which the latter is of importance because of its relationship with water sources, as well as the importance of providing biological corridors for wildlife.

Specifically in the case of the northern zone it is important to note that there is a protected area, identified as Laguna de Términos. This area has a high conservation value given the importance of its ecosystem to the region.

The project's areas of greater interest are the areas of intervention with environmental management, and all areas suitable for agriculture and forestry handling that can be identified as Agricultural-Livestock-Forestry vegetation cover.

In the Appendix (Thematic Cartography (biotic zoning)) the Environmental Management Zoning map for the northern zone of the abiotic component is shown. It includes the results presented in Figure 26.

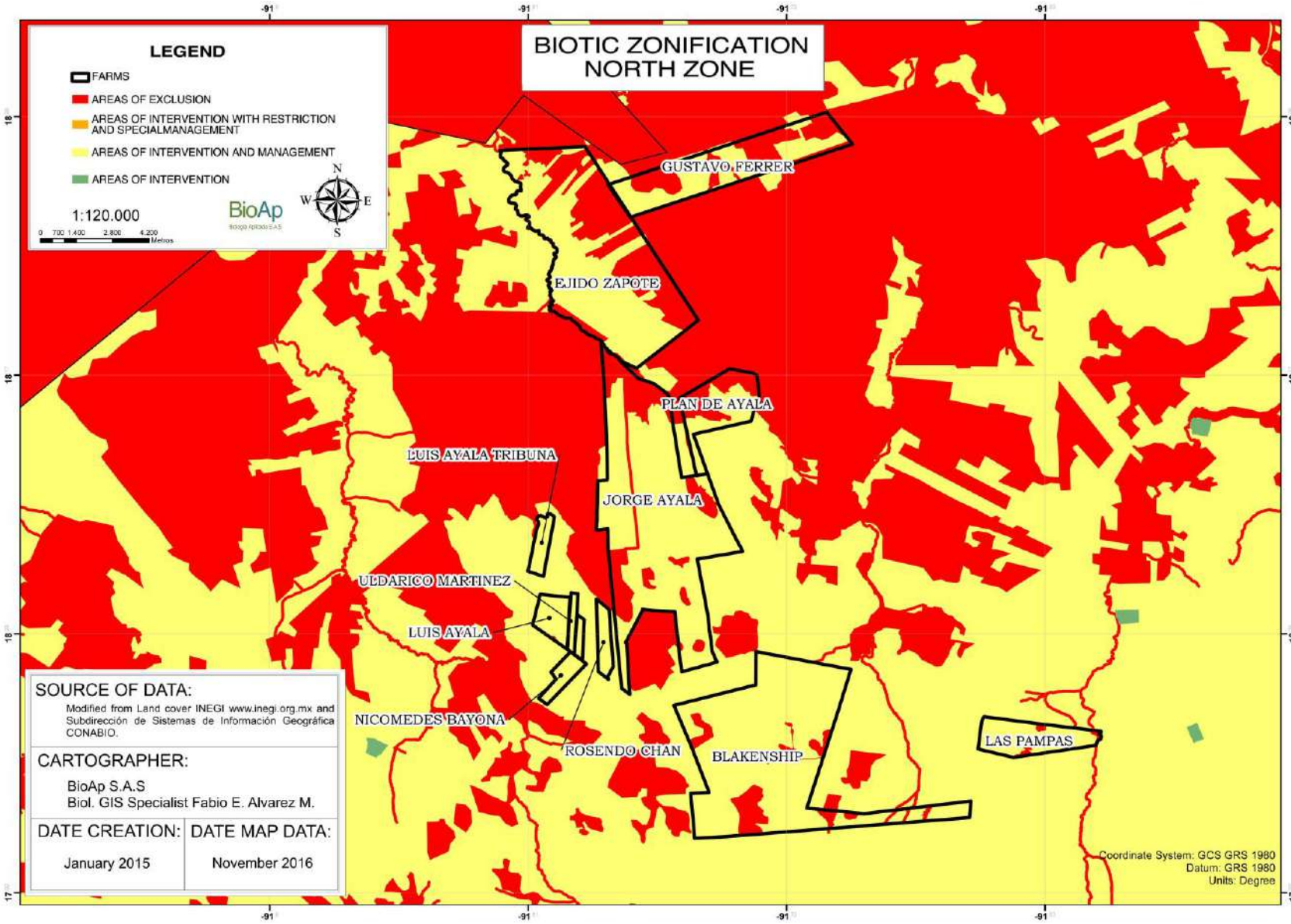


Figure 26. Northern Zone Biotic environmental zoning

3.1.2.2 Western zone

Areas of exclusion of the biotic component are seen as areas with the following vegetation covers: Evergreen Forests, and Hydrophilic Vegetation, of which the latter is of importance because of its relationship with water sources, as well as the importance of providing biological corridors for wildlife.

The project's areas of greater interest are the areas of intervention with environmental management, and all areas suitable for agriculture and forestry handling that can be identified as Agricultural-Livestock-Forestry vegetation cover.

In Appendix (Thematic Cartography (biotic zoning)) the Environmental Management Zoning map for the western zone of the abiotic component is shown. It includes the results presented in Figure 27.

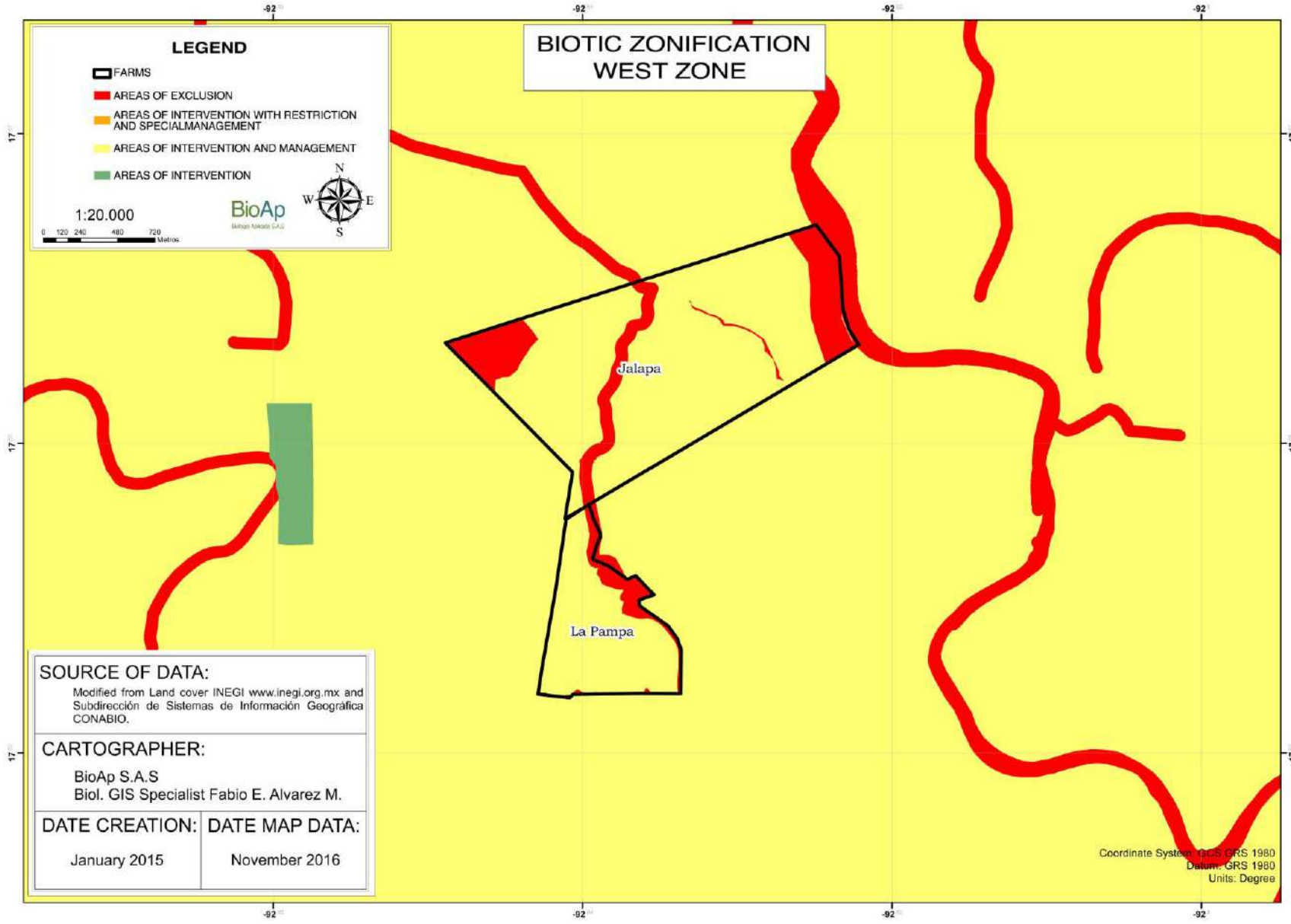


Figure 27. Western Zone Biotic environmental zoning

3.1.2.3 Eastern Zone

Areas of exclusion of the biotic component are seen as areas with the following vegetation covers: Evergreen Forests, Oak Forests and Hydrophilic Vegetation, of which the latter is of importance because of its relationship with water sources, as well as the importance of providing biological corridors for wildlife.

The project's areas of greater interest are the areas of intervention with environmental management, and all areas suitable for agriculture and forestry handling that can be identified as Agricultural-Livestock-Forestry vegetation cover.

The Environmental Management Zoning map for the eastern zone of the abiotic component is shown in Figure 28.

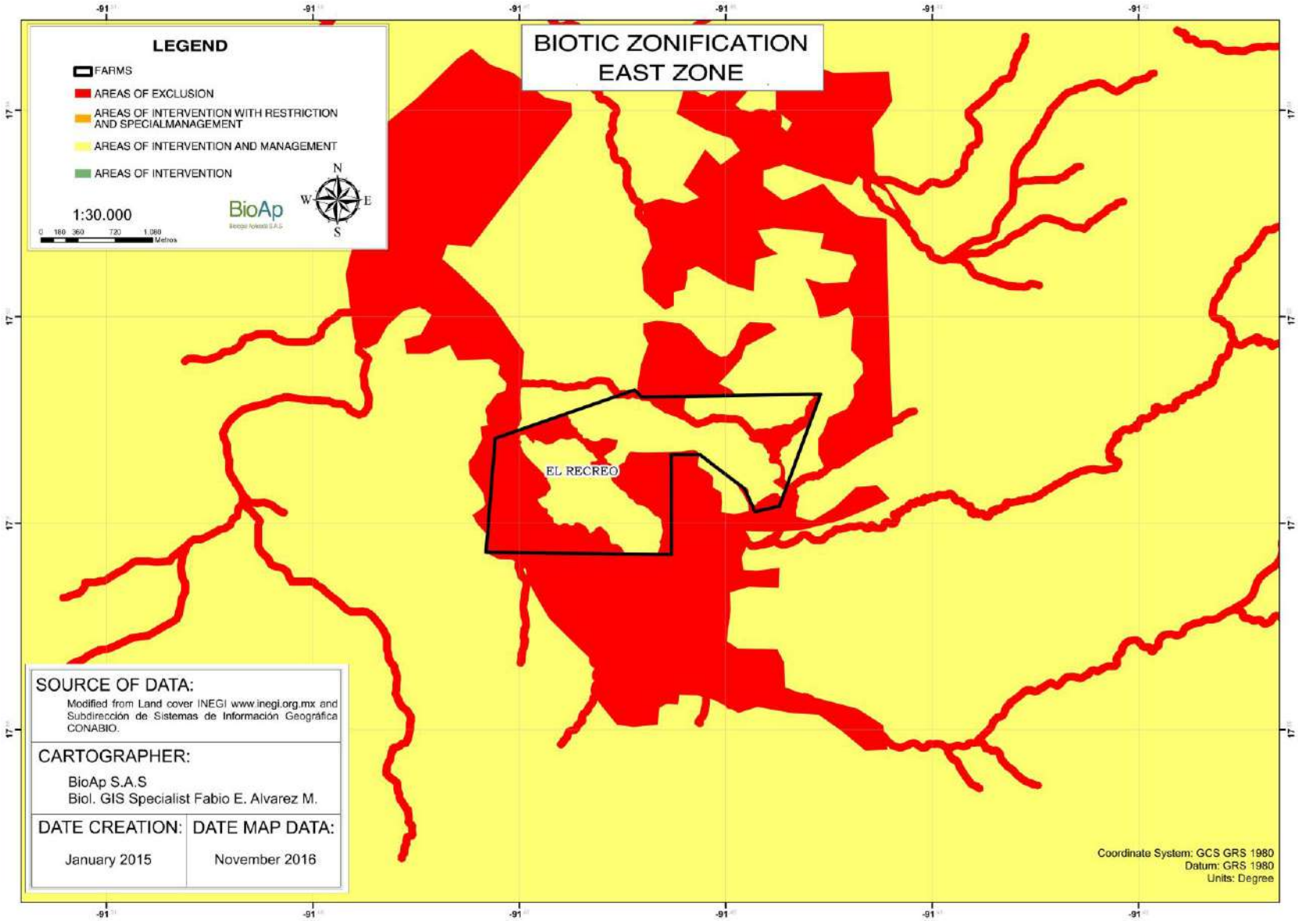


Figure 28. Eastern Zone Biotic environmental zoning

3.1.3 Socio-environmental zoning results

3.1.3.1 Northern zone

The northern region has 12 properties that are located in the municipalities of Palizada and Carmen, in the state of Campeche.

Population centers near the premises have been identified as exclusion zones for this sector and were given a sensitivity rating of "Very High" (shown in red) and a 100 meter buffer, as these areas are usually places that encompass a concentration of government and/or private institutions. These have equipment and service offers (mainly commercial) not only for those who live there but also for the surrounding communities. Thus, the population centers are consolidated as areas of great importance given the social dynamics and commercial activities carried within these.

With regards to the areas of restricted intervention and special management, the main irrigation system was found to be in the Jorge Ayala premises and the municipality of El Zapote's communal lands. These were assigned a "High" sensitivity rating and given a 20-meter buffer. Irrigation systems are an important part of the local infrastructure for the development of any agricultural activity (especially in times of drought), and should be considered for special management. On the other hand, the irrigation system belongs to the local community and was built by the state government. This makes it a space that represents public goods and which has collective rights.

Areas of restricted intervention and special management also include public services such as schools, health centers and deep wells (including water that is gathered for human consumption) located within communal territories; as well as other schools and health centers in the towns and villages surrounding the premises. These areas were assigned a "High" sensitivity rating (shown in orange) and a buffer of 50 meters, as these areas are essential to maintaining a good quality of life, meet the basic needs of the community, and an effective exercise of fundamental human rights.

On the other hand there are areas of intervention and management where secondary irrigation system are located on the Jorge Ayala premises, the municipality of El Zapote's communal lands, and other irrigation lines located near the premises. This infrastructure was assigned a "Medium" sensitivity rating (shown in yellow) and a buffer of 10 meters. By enabling the water collected by the main irrigation system to be distributed, secondary irrigation systems are also considered as an important part of infrastructure in agricultural activities, so their conservation is encouraged.

The areas of intervention are represented in green and are suitable territories to consider developing the project's activities.

The white areas make reference to zones that have been deemed as ecologically important as can be seen in, and have been taken into account by the abiotic and biotic zoning, but that has not been included in this analysis. This is because to some degree there is an evident dissociation of the communities from their natural environment, to the extent that they flock to nearby towns or community stores within the territories to purchase manufactured food products, with a diminishing direct supply from their natural environment.

Figure 29 shows the social component of the northern zone's Environmental Management Zoning map.

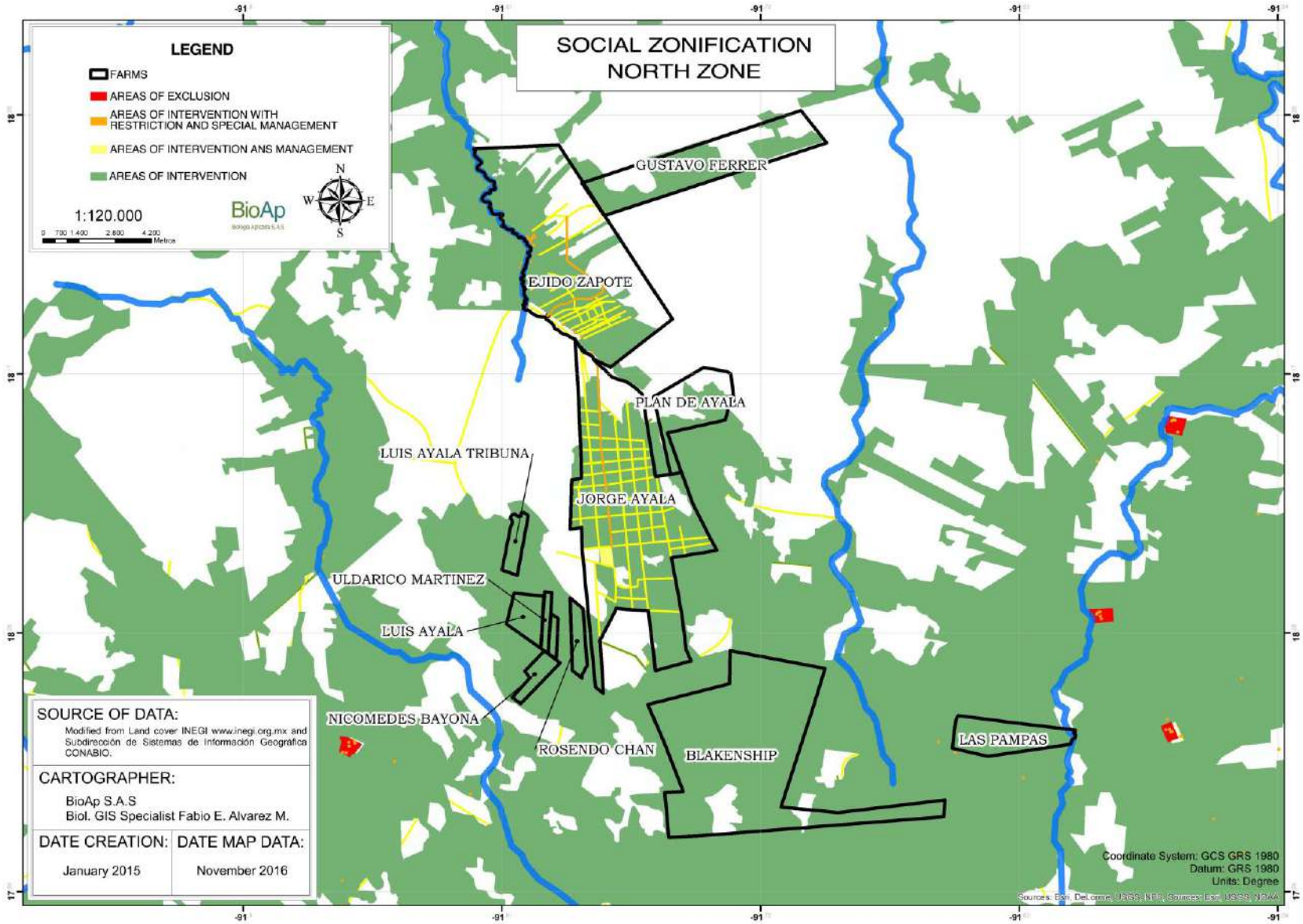


Figure 29. Northern Zone Socio-environmental zoning

3.1.3.2 Western Zone

The western region has two premises that are located in the municipalities of Jalapa and Tacotalpa, in the state of Tabasco.

These plantation estates identify population centers, and areas of archaeological and cultural interest of the different municipalities as areas of exclusion. These areas were assigned a "Very High" sensitivity level (shown in red) and have a 100-meter buffer. The archaeological sites not only preserve the vestiges of the many civilizations that preceded us, and the cultural heritage of a nation, but also represent a potential for economic development focusing on tourism.

Infrastructural education facilities and health centers belonging to towns near the premises are where the areas of restricted intervention, and special management are located. These areas have been assigned a “High” sensitivity rating (represented in orange) with a 50-meter buffer.

This zone has no areas of intervention and special management.

The areas of intervention are represented in green and are areas to be considered for the development of project activities, as presented in Figure 30.

Figure 30 shows the social component of the western zone’s Environmental Management Zoning map.

The white areas make reference to zones that have been deemed as ecologically important, and have been taken into account by the biotic zoning, but that have not been included in this analysis.

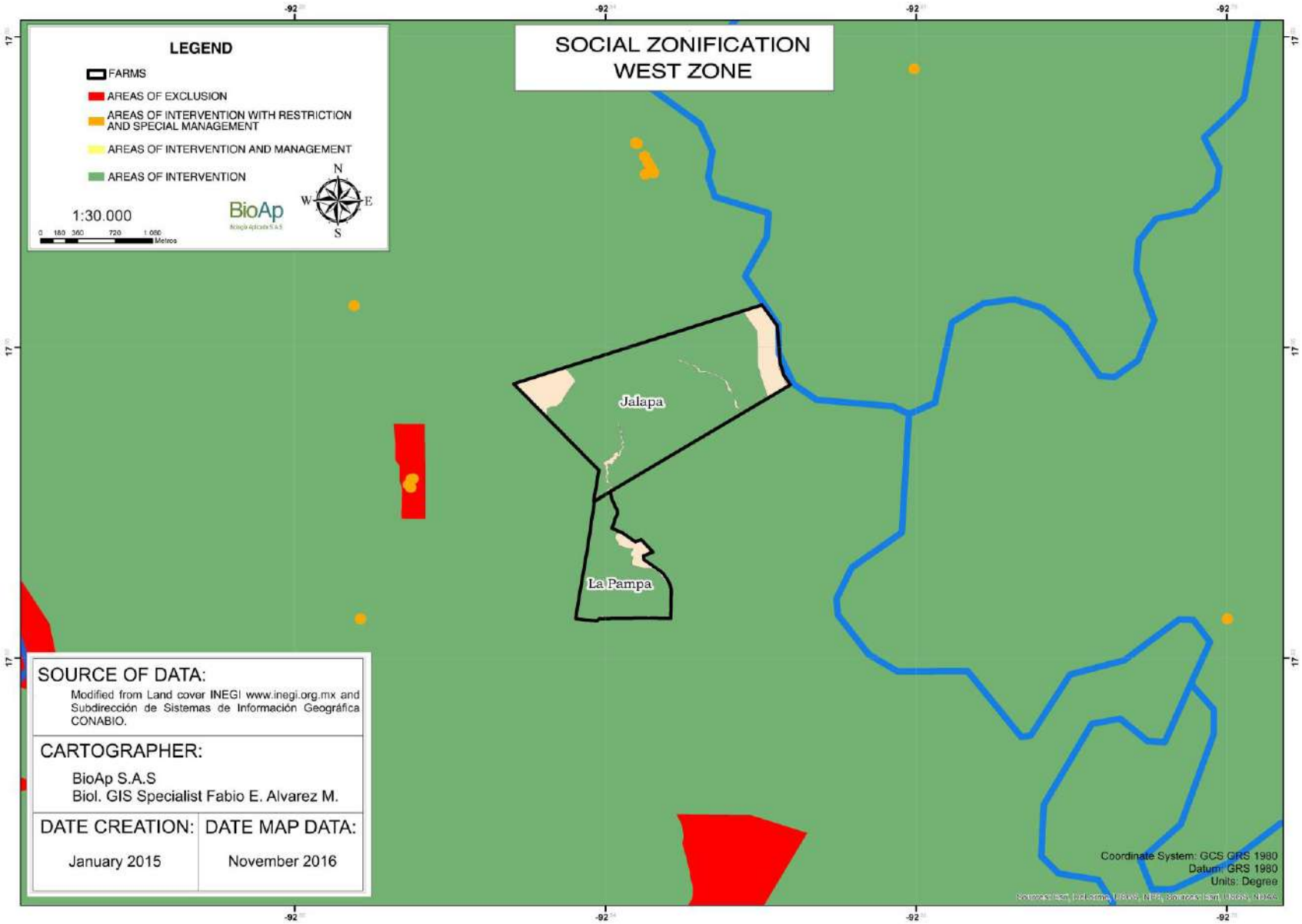


Figure 30. Western Zone Socio-environmental zoning

3.1.3.3 Eastern Zone

The eastern zone region has one property, El Recreo, which is part of the municipality of Balancán in the state of Tabasco.

This zoning has not identified areas of exclusion.

With respects to areas of restricted intervention and special handling, these are located where the schools and health centers that make part of the social infrastructure of towns near the premises. These areas were assigned a "High" sensitivity rating (shown in orange) and a 50-meter buffer.

The areas of intervention and management highlight a road coming from the municipality of Emiliano Zapata, located in the vicinity of the plantation estate. It has been assessed a sensitivity rating of "Medium" (shown in yellow) and a 10 meter buffer, as shown in Figure 31.

The areas of intervention are represented in green and are areas to be considered for the development of project activities.

Figure 31 shows the social component of the eastern zone's Environmental Management Zoning map.

The white areas make reference to zones that have been deemed as ecologically important, and have been taken into account by the biotic zoning, but that have not been included in this analysis.

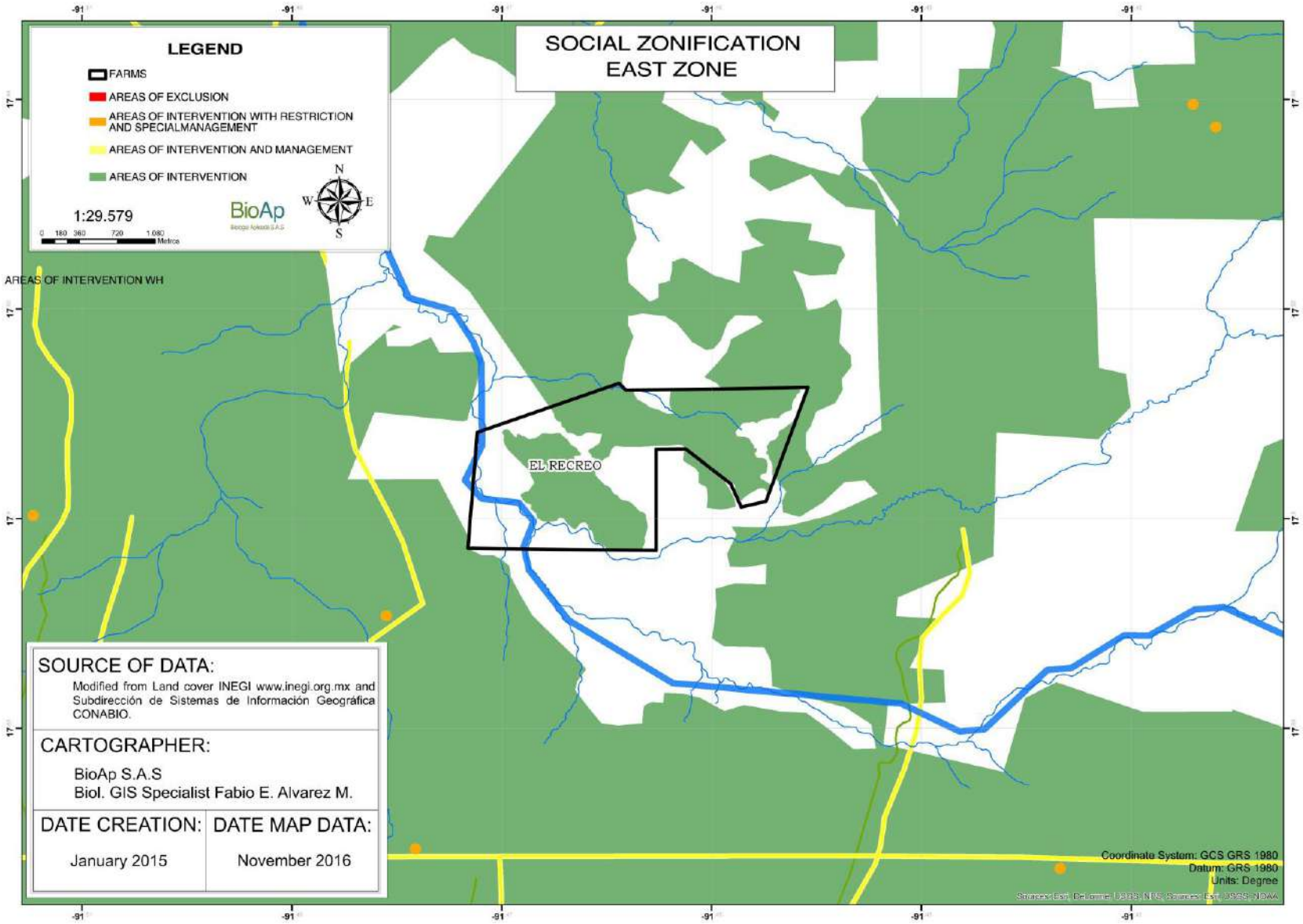


Figure 31. Eastern Zone Socio-environmental zoning

3.2 LUC Finding and Results

3.2.1 Change of RSPO cover coefficients on PSN company farms

Figure 32 to Figure 43 show plant cover maps from 2005, 2007, 2009 and 2015 according to RSPO coefficients.

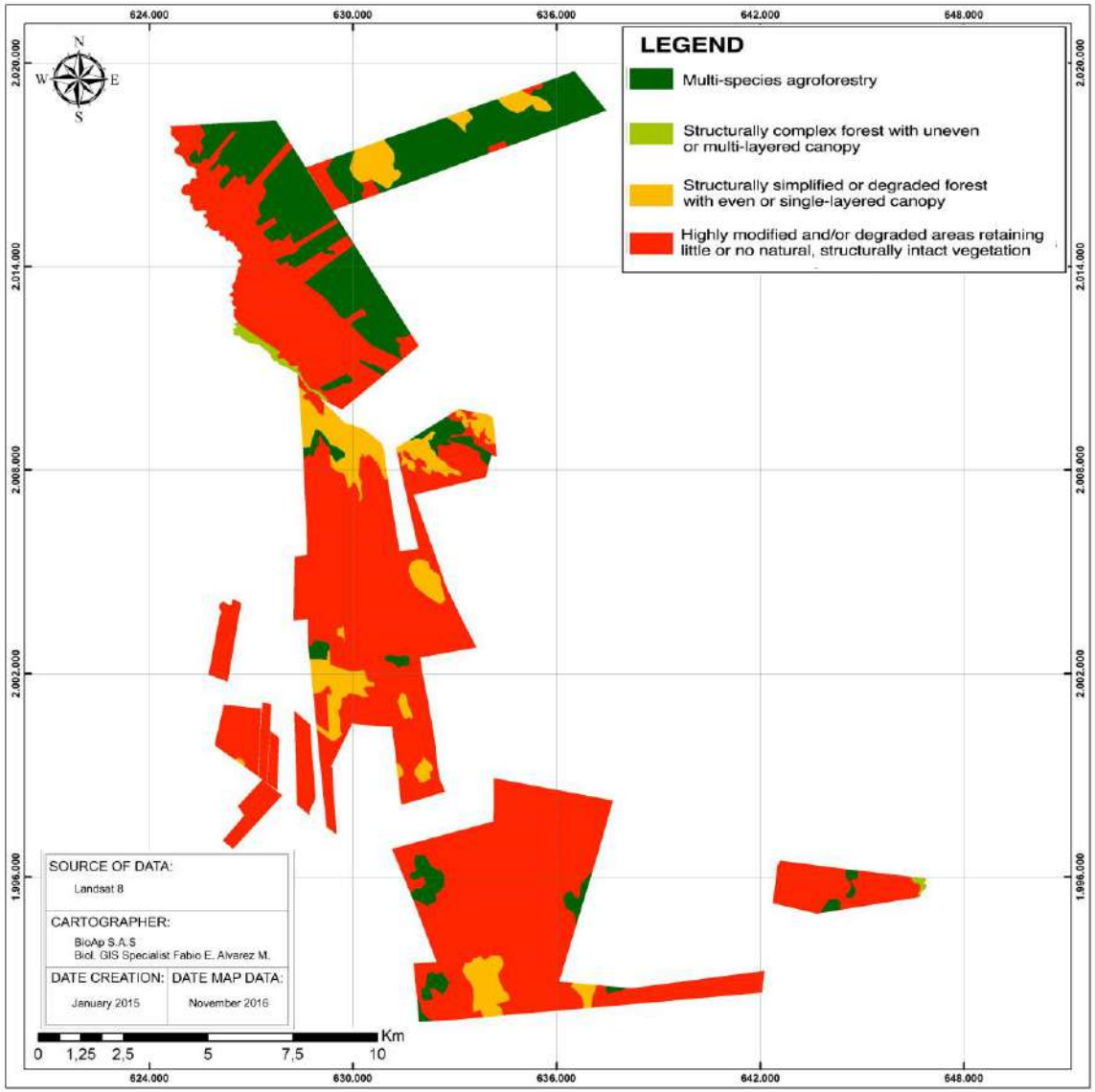


Figure 32.RSPO Coefficients Northern Zone 2005

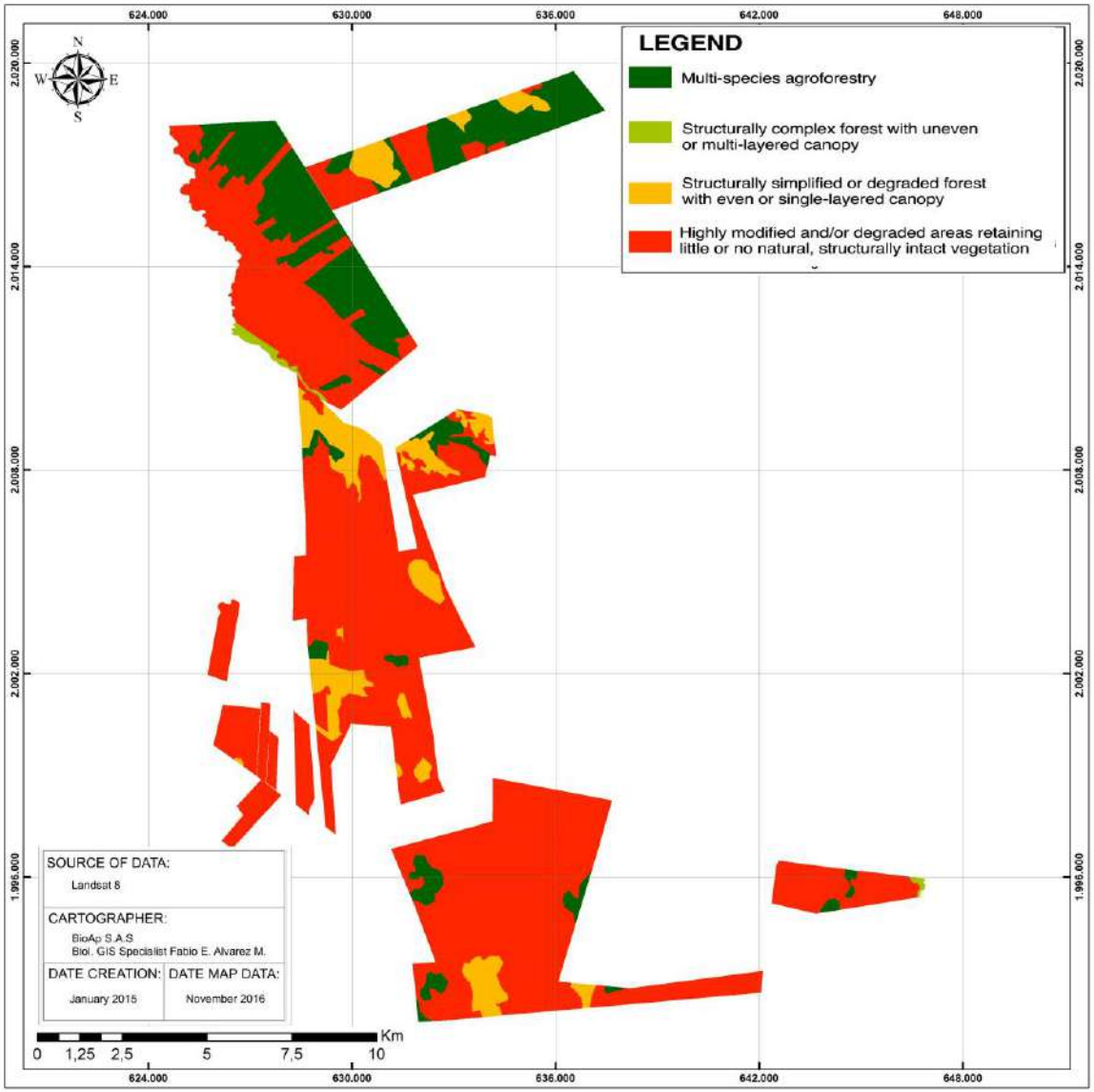


Figure 33.RSPO Coefficients Northern Zone 2007

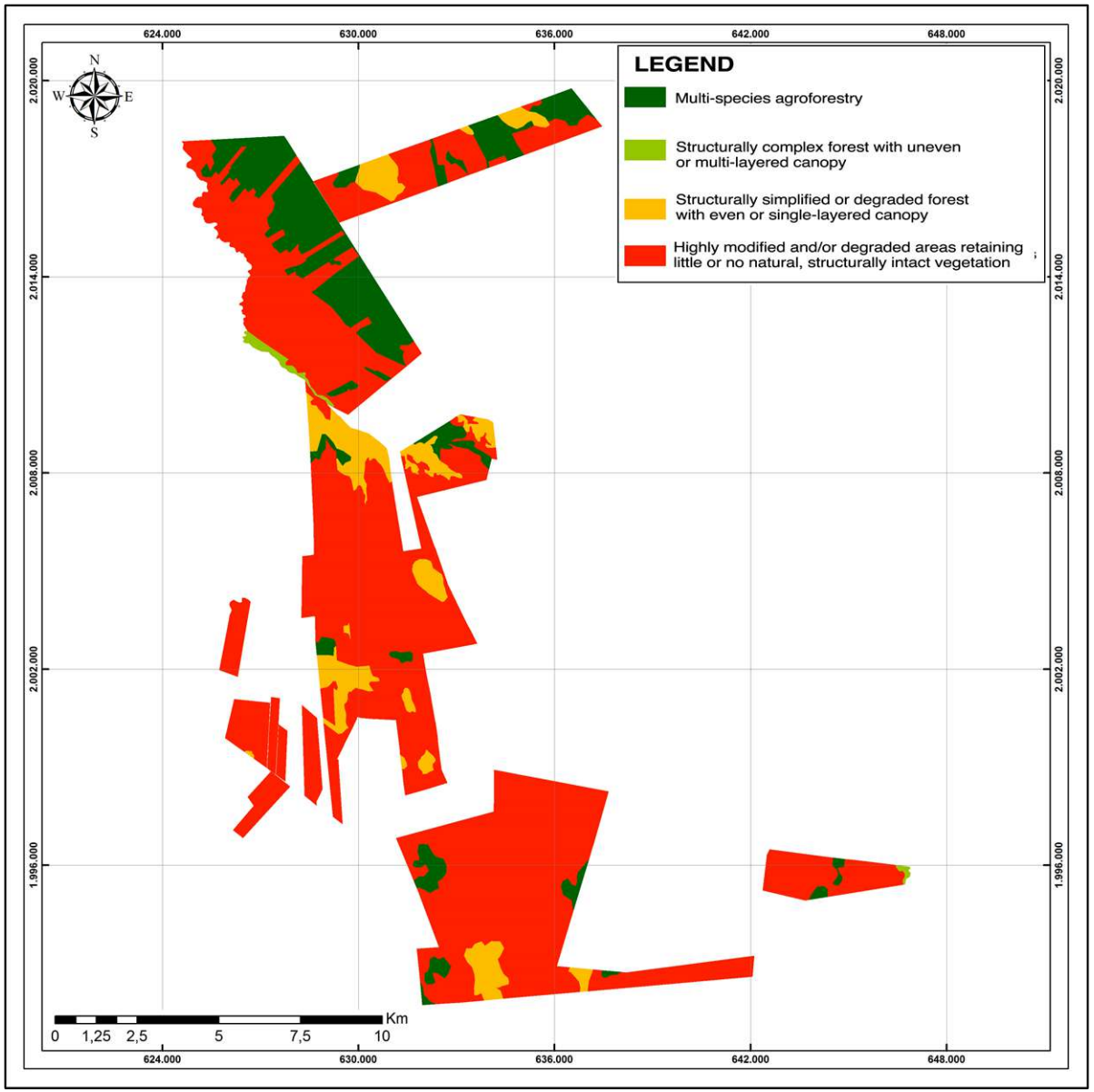


Figure 34.RSPO Coefficients Northern Zone 2009

Figure 35.RSPO Coefficients Northern Zone 2015

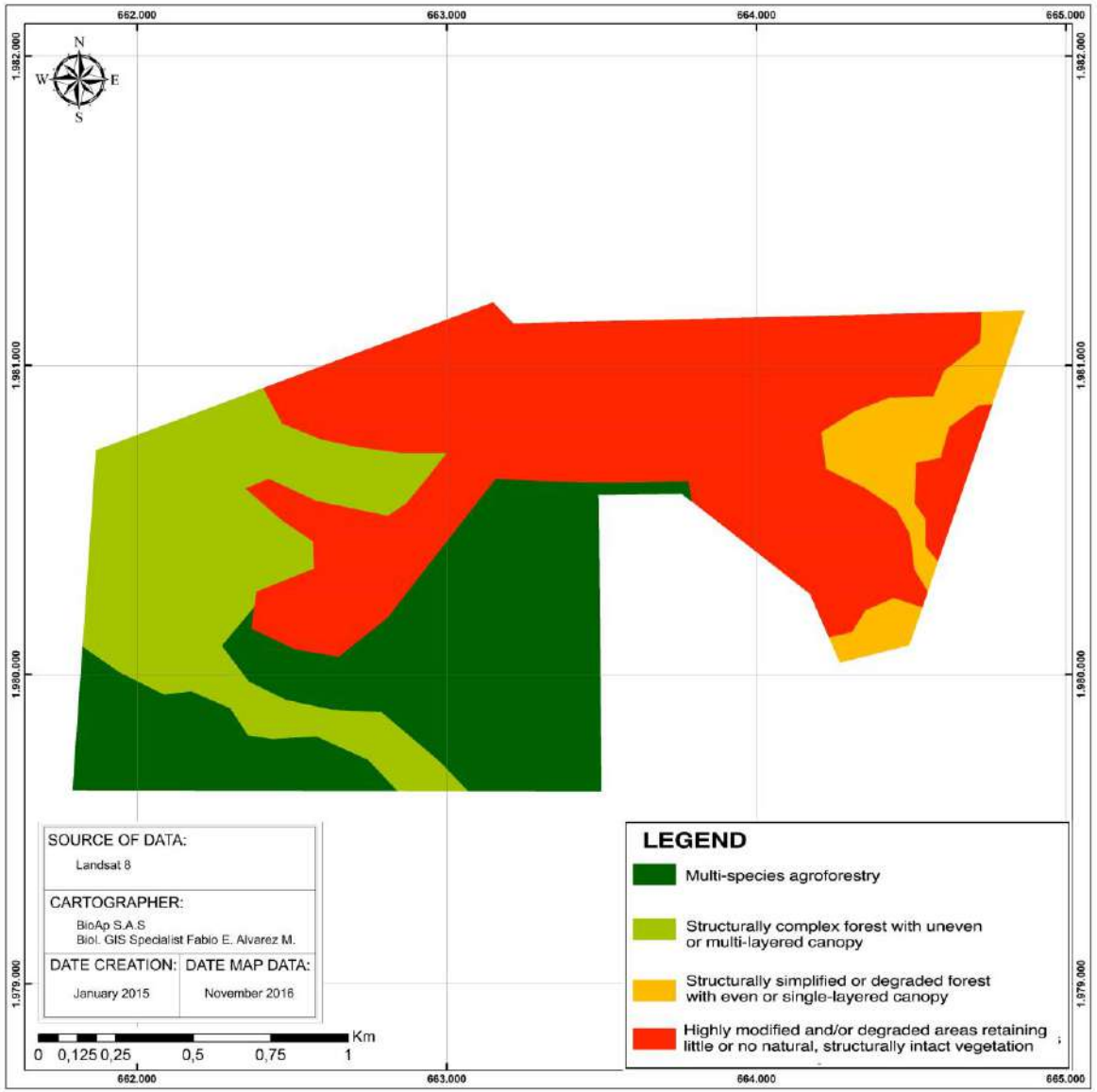


Figure 36.RSPO Coefficients Eastern Zone 2005

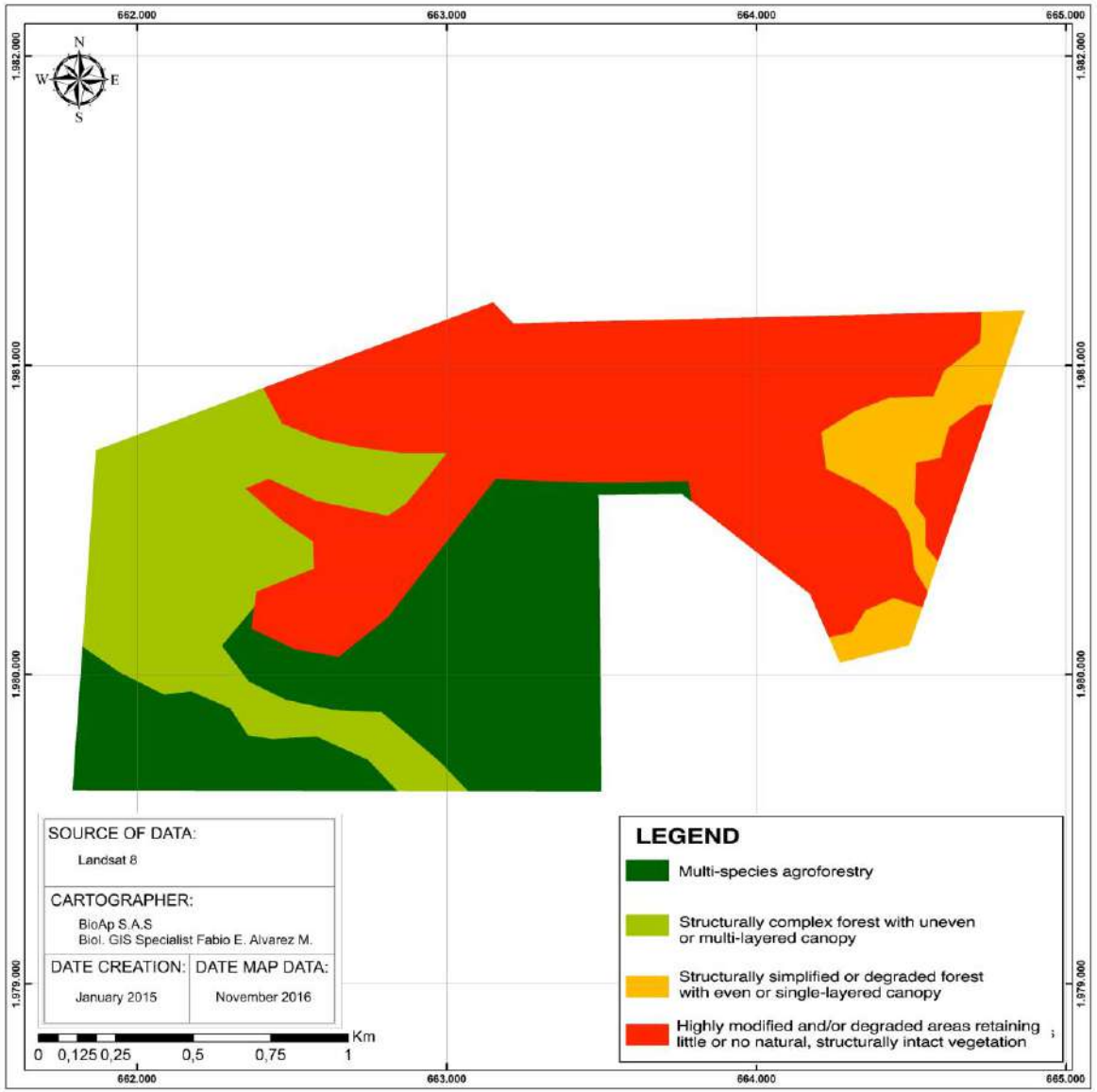


Figure 37.RSPO Coefficients Eastern Zone 2007

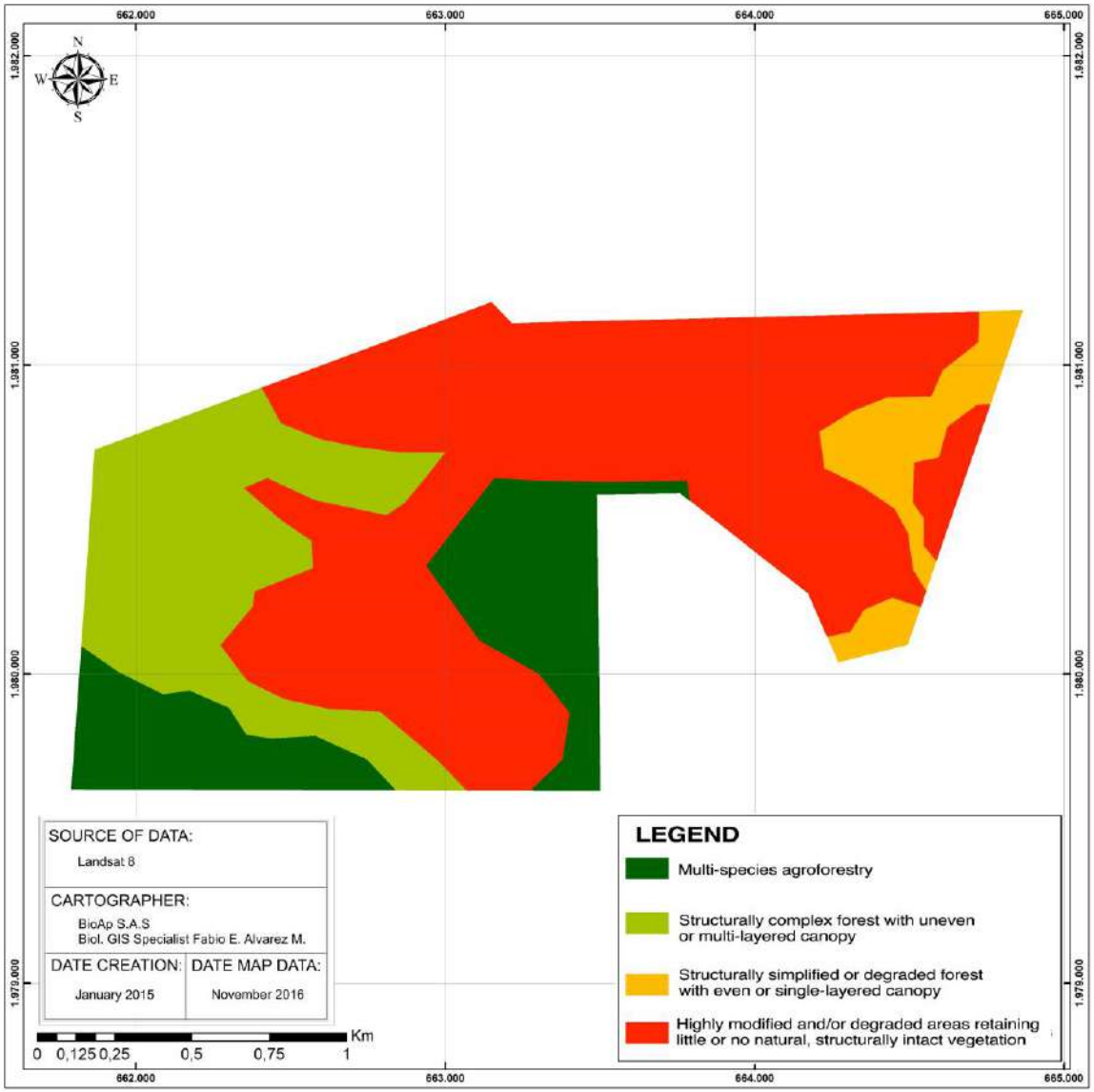


Figure 38.RSPO Coefficients Eastern Zone 2009

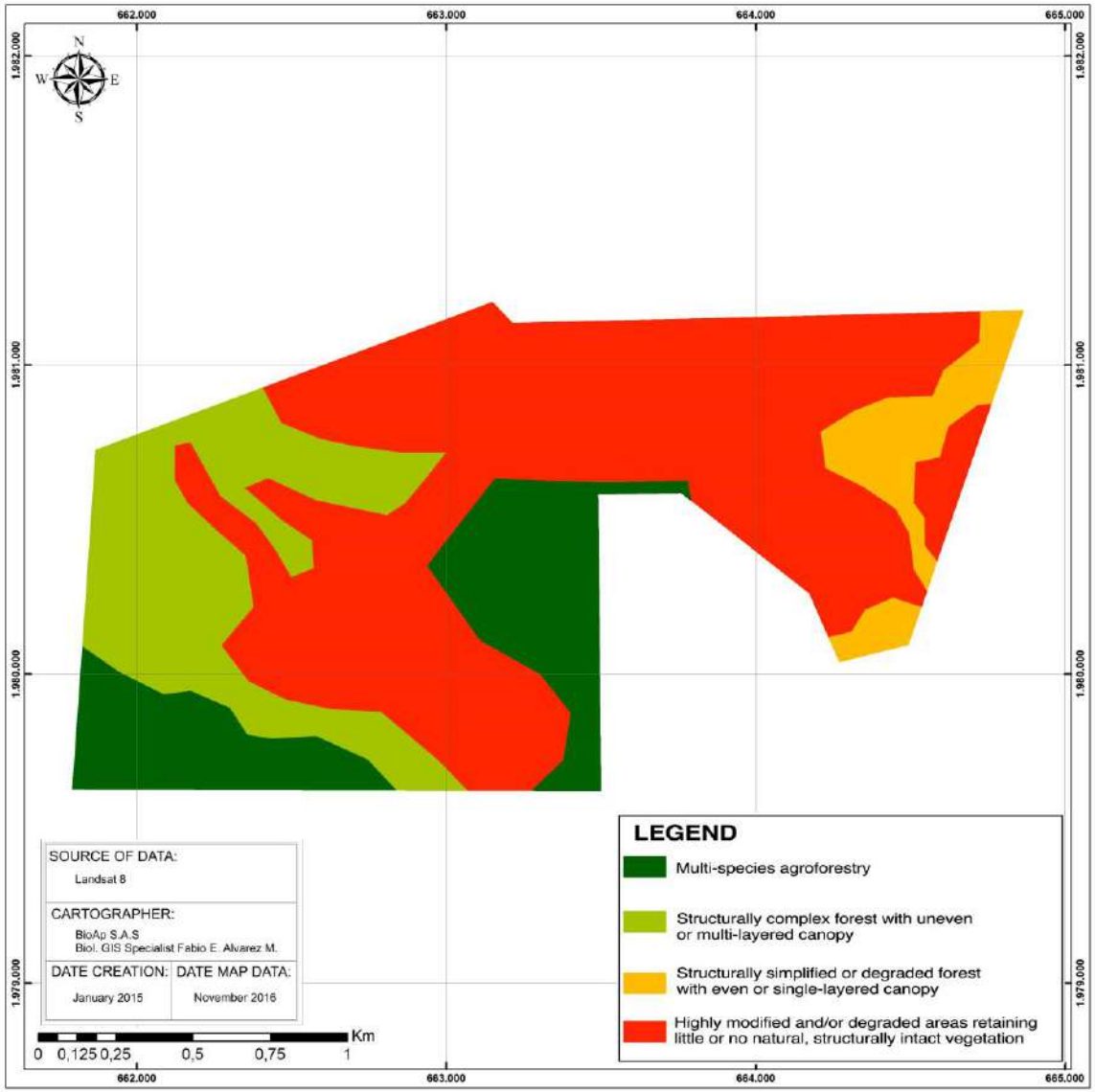


Figure 39.RSPO Coefficients Eastern Zone 2015

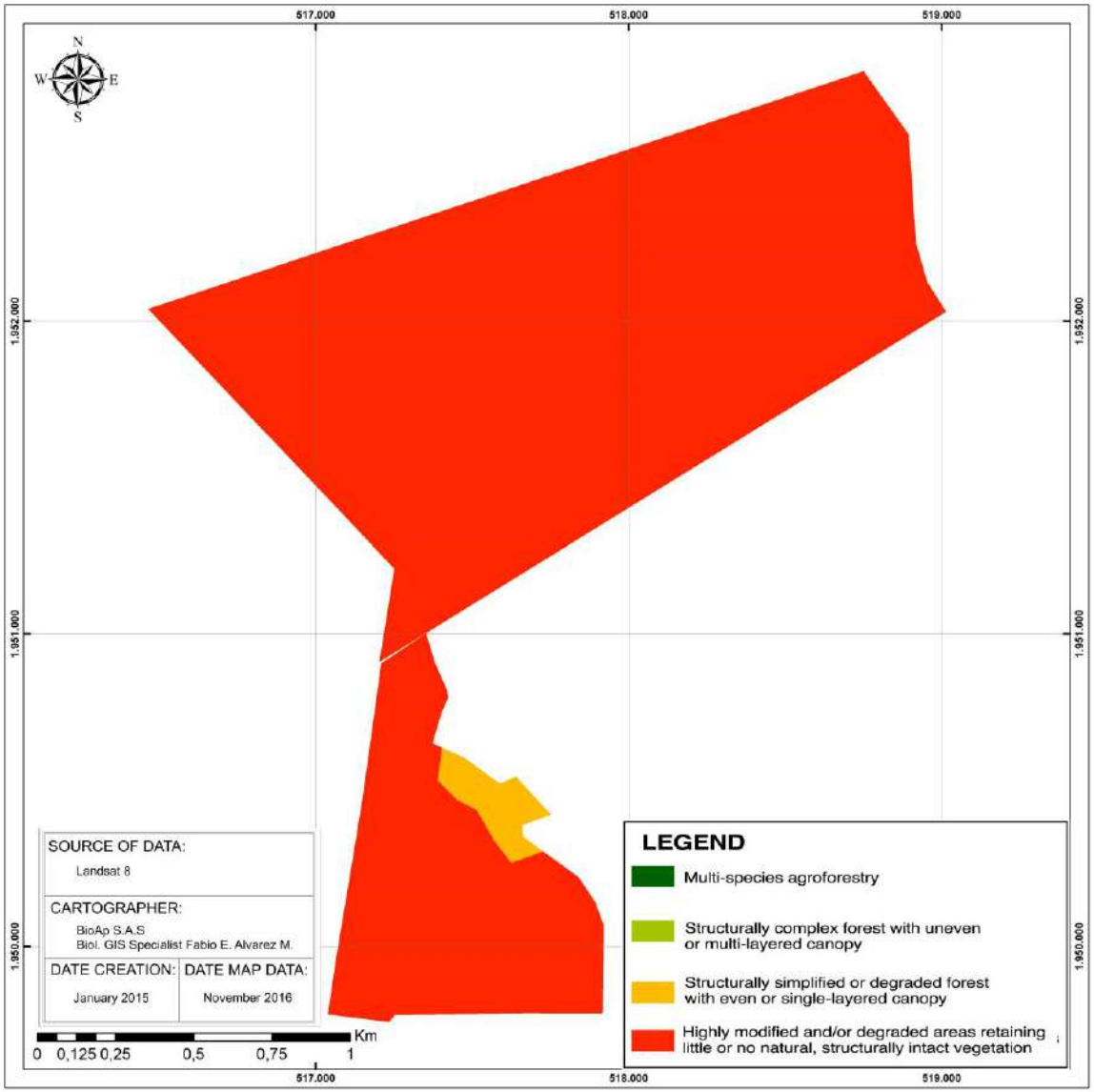


Figure 40.RSPO Coefficients Western Zone 2005

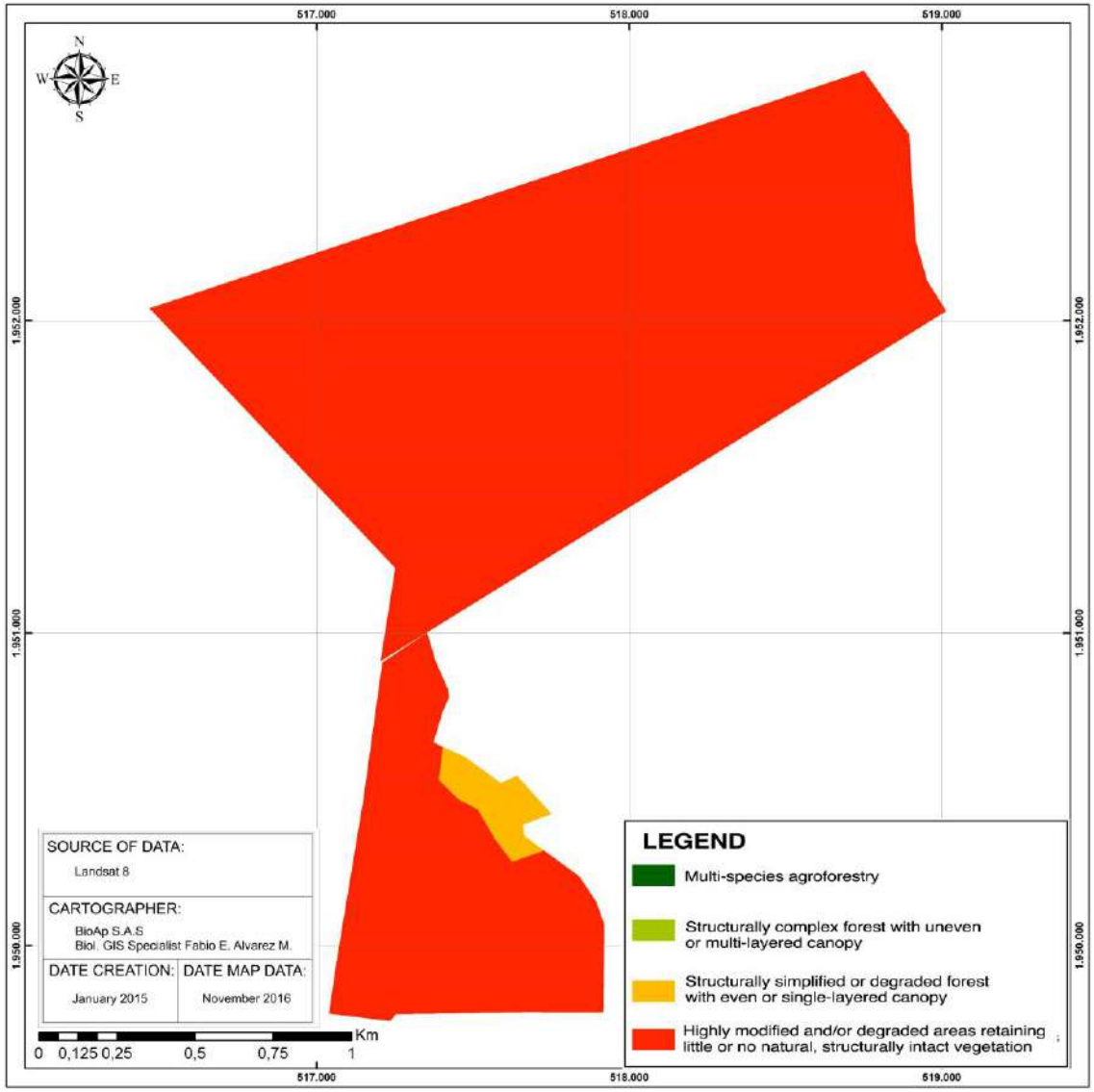


Figure 41.RSPO Coefficients Western Zone 2007

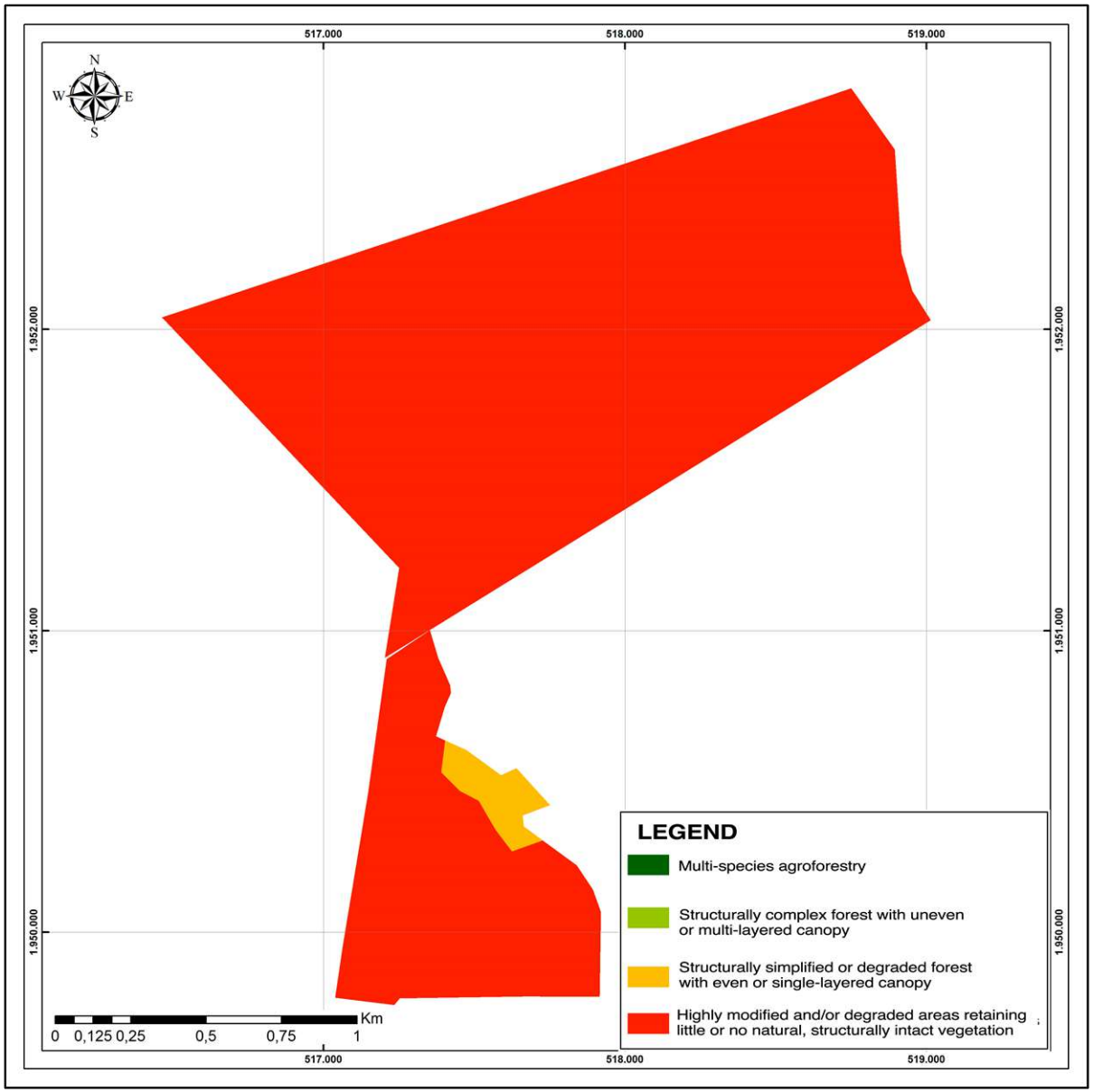


Figure 42.RSPO Coefficients Western Zone 2009

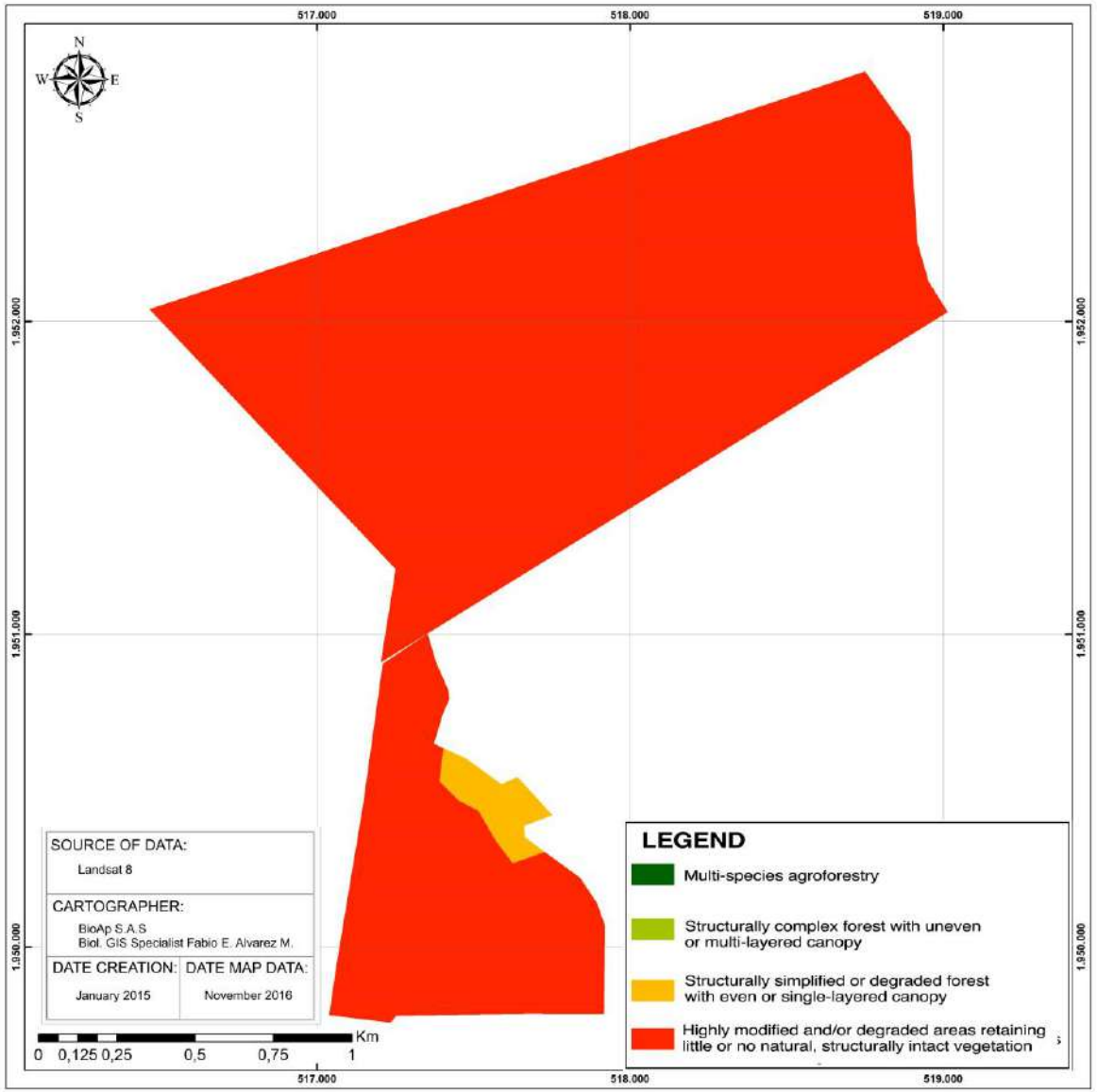


Figure 43.RSPO Coefficients Western Zone 2015

Table 14 shows the total results in Hectares (ha) of RSPO coefficient areas in plantations for each date on which they were evaluated.

Table 14 Vegetation coefficient tables

	Farm	Coefficients by year																Cover Change											
		2005				2007				2009				2015				2005 - 2007				2007 - 2009				2009 - 2015			
		1	0,7	0,4	0	1	0,7	0,4	0	1	0,7	0,4	0	1	0,7	0,4	0	1	0,7	0,4	0	1	0,7	0,4	0	1	0,7	0,4	0
1	Blakenship		191,3	187,6	3015,8		191,3	187,6	3015,8		191,3	187,6	3015,8		191,3	187,6	3015,8	0	0	0	0	0	0	0	0	0	0	0	0
2	Ejido El Zapote	59,4		1270,5	1756,8	59,4		1270,5	1756,8	59,4		1270,5	1756,8	59,4		1270,5	1756,8	0	0	0	0	0	0	0	0	0	0	0	0
3	Gustavo Ferrer		226,7	878,7	115,2		219,8	657,0	343,8		203,6	348,8	668,3		193,4	348,8	678,5	0	6,9	221,7	-228,6	0	16,2	308,2	-324,4	0	10,2	0	-10,2
4	Jorge Ayala		612,5	85,2	2805,9		612,5	85,2	2805,9		612,5	85,2	2805,9		604,3	79,8	2819,5	0	0	0	0	0	0	0	0	0	8,2	5,5	-13,7
5	Las Pampas	11,3		33,6	428,6	11,3		33,6	428,6	11,3		33,6	428,6	11,3		33,6	428,6	0	0	0	0	0	0	0	0	0	0	0	0
6	Luis Ayala		3,5		195,0		3,5		195,0		3,5		195,0		3,5		195,0	0	0	0	0	0	0	0	0	0	0	0	0
7	Luis Ayala Tribuna				130,8				130,8				130,8				130,8	0	0	0	0	0	0	0	0	0	0	0	0
8	Nicomedes Bayona				124,4				124,4				124,4				124,4	0	0	0	0	0	0	0	0	0	0	0	0
9	Plan De Ayala		151,0	98,8	318,2		151,0	98,8	318,2		151,0	98,8	318,2		151,0	44,3	372,6	0	0	0	0	0	0	0	0	0	0	54,5	-54,5
10	Polo Bayona				44,7				44,7				44,7				44,7	0	0	0	0	0	0	0	0	0	0	0	0
11	Rosendo Chan				136,5				136,5				136,5				136,5	0	0	0	0	0	0	0	0	0	0	0	0
12	Uldarico Martínez				61,9				61,9				61,9				61,9	0	0	0	0	0	0	0	0	0	0	0	0
13	Jalapa				229,2				229,2				229,2				229,2	0	0	0	0	0	0	0	0	0	0	0	0
14	La Pampa		5,6		59,2		5,6		59,2		5,6		59,2		5,6		59,2	0	0	0	0	0	0	0	0	0	0	0	0
15	El Recreo	94,3	20,1	69,3	144,9	69,3	20,1	94,3	144,9	69,3	20,1	58,4	180,8	63,9	20,1	58,4	186,3	25,0	0	-25,0	0	0	0	35,9	-35,9	5,4	0	0	-5,4

Source: BioAp S.A.S 2015

3.2.2 Change in natural covers

The GUSTAVO FERRER, JORGE AYALA, PLAN DE AYALA and EL RECREO farms showed land use change from 2005 to 2015 (Table 15).

Table 15. Areas with land use change on potetial PSN farms.

Farm	Cover Change											
	2005 - 2007				2007 - 2009				2009 - 2015			
	1	0,7	0,4	0	1	0,7	0,4	0	1	0,7	0,4	0
Gustavo Ferrer	0	6,9	221,7	-228,6	0	16,2	308,2	-324,4	0	10,2	0	-10,2
Jorge Ayala	0	0	0	0	0	0	0	0	0	8,2	5,5	-13,7
Plan De Ayala	0	0	0	0	0	0	0	0	0	0	54,5	-54,5
El Recreo	25,0	0	-25,0	0	0	0	35,9	-35,9	5,4	0	0	-5,4

Source: BioAp S.A.S 2015

3.3 HCV Findings and Results

Acceptance Letter of HVC Assessment was issued by Palmicultores San Nicolás S.P.R. de R.L. on 27th may, 2016.

OLEOPALMA

27 de mayo de 2016

La Dirección de la Empresa Palmicultores San Nicolás S.P.R. de R.L. (filial de Agroindustrias de Mapastepec, S.A. de C.V.) acepta la evaluación de Altos Valores de Conservación (AVC) , realizada para las plantaciones que están bajo su administración. Así mismo, se compromete a implementar las recomendaciones de manejo y monitoreo descritas en el reporte entregado por Biología Aplicada (BioAp, S.A.S).

Cordialmente,

Ing. José Luis Pérez Morett
Director General
Grupo Oleopalma
Palmicultores San Nicolás, S.P.R. de R.L.

Biología Aplicada, S.A.S se hace responsable de las conclusiones y recomendaciones expresadas en los documentos de evaluación.

Atentamente,

Biólogo Juan Pablo Zorro Cerón
Asesor Líder
BioAp S.A.S.
ALS14011JZ

3.3.1 Social context

As shown by the INEGI in 2010 the population distribution in this municipalities was Presentd as follows: Emiliano Zapata had 29.518 people; Balacan was inhabited by 56.739 people, Jalapa had 36.391 people and Tacotalpa was inhabited by 46.302 people. It also showed that Emiliano Zapata`s municipality is where a large porcentaje of urban population could be found, whereas in Balacan, Jalapa and Tacotalpa more than 50% of the population livs in rural áreas.

In 2010 Palizada was inhabited by 8.352 people. On the other hand, El Carmen was inhabited by 221.094 people. From the total population of Palizada, at least 50% lives in the municipalities rural zones, while El Carmen more than 60% of the inhabitants are located inside the urban areas.

3.3.2 Protected areas

According to Mexico`s priority hydrological regions, the evaluated areas are located in the Northern Zone which belong to hidrologic region of Laguna de Terminos. Pantanos de Centla constitutes a natural unit with ecological and biological processes.

3.3.3 Hidrology

The study area belongs to the hydrologic region Grijalva - Usumancinta. According to the mapping, the evaluated estates are divided into three main areas. The first is the area is called as Northern, and includes the Usumacinta River basins and Laguna de Terminos, the sub-basins are Laguna del Este which occupies an area of 10,605.89 ha, Chumpán river with 482.78 ha and the Paliza river with 1872.46 ha. The Southwest area includes the river`s basin Grijalva - Villahermosa, which at the same time contains sub-basins from the Sierra and Tacotalpa River and the South Eastern area which belongs to Laguna de Terminos basin and Chumpán River sub-basin with 328.5Ha.

3.3.4 Geology and Soil science

Mexico`s southeast local environment is mainly controlled by three elements that make up the Gulf of Mexico and the Mexican southeast, which are: Yucatan platform, Chiapas mountain range and southeast`s tertiary basins. These tectono-sedimentary elements are products of different tectonic events, sedimentological, stratigraphic and structural that are evolution-related of the Gulf of Mexico and particularly in the study area. As for soil classes there can be found three types: Vertisols, Gleysols and Cambisols.

3.3.5 Precipitation and temperature

According to the climate vector component from INEGI`s geographic database (GDB), the places where its intended to start African palm cultivation as shown by Mexico`s climatic levels according to Mexico`s classification for climatic zones the areas belong to warm and semi warm groups. This type of weather is characterized by temperatures between 22 and 26ºC also 2000 to 4000 mm rainfall throughout during the year.

3.3.6 Mexico´s ecoregions

The evaluated area can be found within the ecoregion “dry warm jungles” (LEVEL I), specifically in the coastal plains and dry lomerios from the Gulf of Mexico (Level II). The northern part of the area evaluated in the State of Campeche is inside of two LEVEL (IV) ecoregions which corresponds to two types of characteristic vegetation such as wetlands located in the southern part of the Gulf of Mexico and the high evergreen forest of the plain Gulf coast (INEGI - CONABIO, 2008).

3.3.7 Biogeography Areas

Mexico´s biogeographic map of provinces shows that most of the evaluated properties are located in the Gulf of Mexico province, except for a single property, Las Pampas, which is located in Peten´s province.

3.3.8 Identified HCVs

Table 16 shows a summary about the identified HCV at the study area.

Table 16. Identified HCV in the study area

HCV	HCV Description	Present	Potential	Absent
1.1	Protected areas	Present		
1.2 **1.3**	Threatened or endangered species and endemic species	Present		
1.4	Critical temporary usages			Absent
2	Large scale landscape ecosystems with global, regional and national significances, which contains or are contained within the management area, and where viable populations from all or most species show natural patterns about its distribution and abundance.	Present		
3	Areas containing threatened or endangered ecosystems.	Present		
4	Basic ecosystemic services (water catchment)	Present		
5	Main areas that will satisfy local communities' basic needs.		Potential	
6	Critical areas for the traditional-cultural identity of communities (species with cultural, ecological, economic or religious significance).	Present		

Source: BioAp S.A.S 2015

3.3.9 Found HCV justification

3.3.9.1 HCV 1.1

Using Mexico`s Federal Protected Areas mapping (CONANP, 2012) and State and Municipal (Bezaury-Creel et al 2010) an information cross-checking was developed with the estates evaluated in the study.

Although no land is located within protected areas, estates located in the northern area, mainly the estate El Zapote and Gustavo Ferrer, are located close to the limits of the buffer zone known as Flora and Wildlife Protection Area Laguna de Terminos. This protected area has the higher volume and extension estuarine-lagoon-system of Mexico. It includes the adjacent marine continental platform, rivers connection to the sea; Isla del Carmen; freshwater mirrors, brackish and estuarine-marine water; grasses submerged areas; “fluviodeltaicos” associated systems; swamps or coastal wetlands and surrounding mangrove forests (Barcenas, 1992).

Figure 44 (HCV 1.1) indicates the buffer zone location of Laguna de Terminos regarding the estates location at the North zone. It also indicates the areas to be considered for HCV 1.1 management and monitoring points for water quality evaluation.

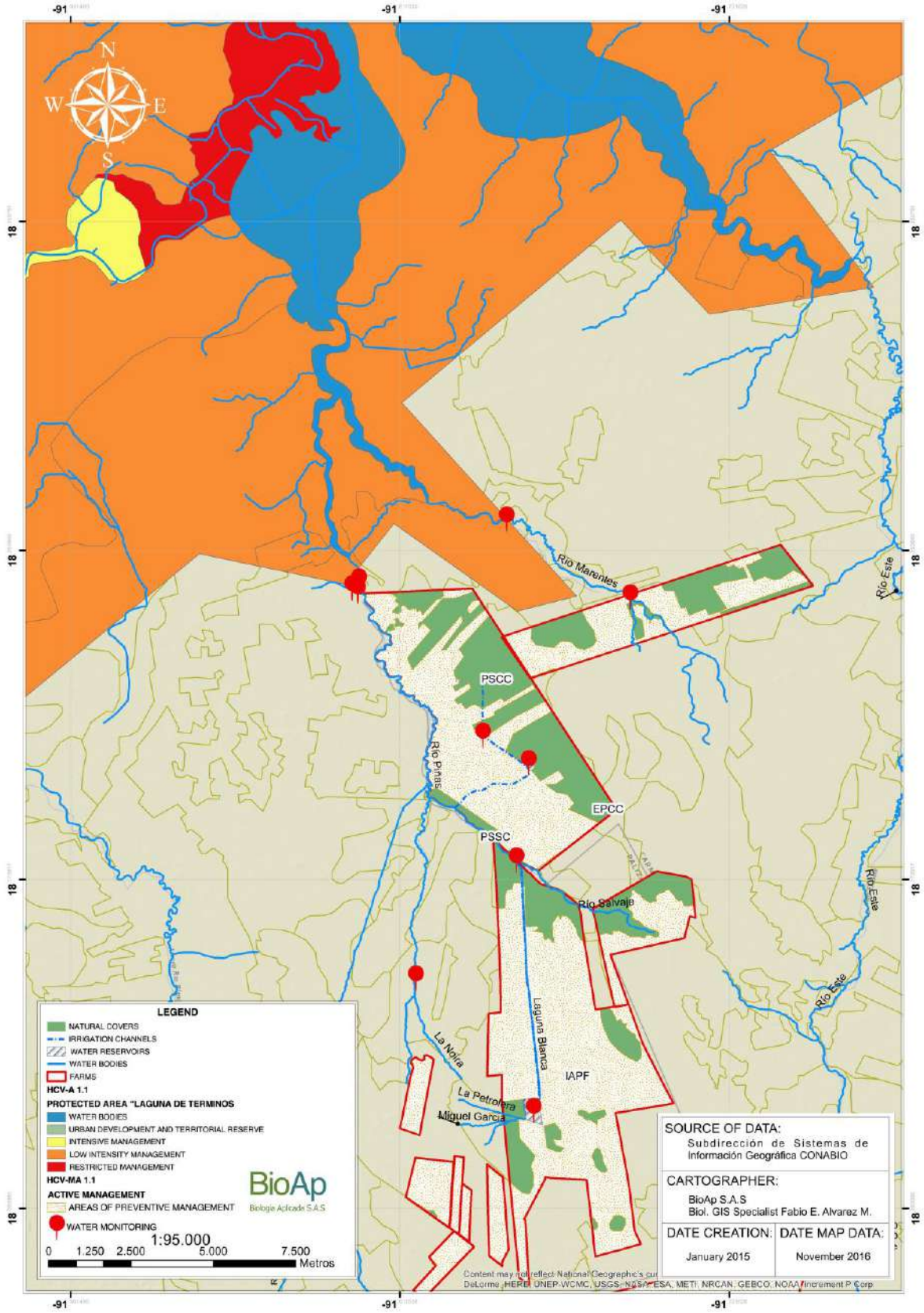


Figure 44.HCV 1.1 Protected areas

3.3.9.2 HCV 1.2 y 1.3

The assessed estates are within the area known as Mesoamerican biodiversity hotspot form the North Region, which includes the States of Campeche, Chiapas, Oaxaca, Quintana Roo, Tabasco and Yucatan.

As a result of the quick ecological evaluation and field work verification 12 plant species and 26 wildlife species were identified as HCV 1.2 and 1.3, due to their conservation status and also they appear or are included as endangered species in any list or appendix, or because the show any endemism or restricted distribution.

Flora

12 vascular flora species were identified and were distributed into 10 genera and 4 families. The family with a larger number of specimens was *Orchidaceae* having 9 species, while *Meliaceae*, *Cactaceae* and *Fabaceae* only showed one specie each. Table 17 shows the list of identified HCV flora 1.2 and 1.3 for the studied area, from which 2 species belong to VU category (UICN Red list). One of the species is found as priority (PR) (NOM-059-SEMARNAT 2010), 10 species are found in the CITES appendix II, while the *Cedrela odorata* is found in CITES appendix III for 6 Latin-American countries.

Table 17. Plant species diversity found in HCV 1.2 y 1.3

Family	Specie	UICN (2015)	Mexico´s General Wildlife Law	NOM-059-SEMARNAT-2010	Status CITES
Cactaceae	*Selenicereus testudo (Karw. ex Zucc.) Buxb.*	DNA	DNA	DNA	II
Fabaceae	*Andira galeottiana (Standl)*	VU	DNA	DNA	-
Meliaceae	*Cedrela odorata L.*	VU	DNA	SP	III
Orchidaceae	*Brassavola nodosa (L.) Lindl.*	DNA	DNA	DNA	II
	Trichocentrum aff. Andreanum	DNA	DNA	DNA	II
	Trichocentrum aff. Luridum	DNA	DNA	DNA	II
	Trichocentrum ascendens (Lindl.) M.W.Chase & N.H.Williams	DNA	DNA	DNA	II
	Erytrhodes sp.	DNA	DNA	DNA	II
	Oeceoclades maculata (Lindl.) Lindl.	DNA	DNA	DNA	II
	Brassavola nodosa (L.) Lindl.	DNA	DNA	DNA	II
	Oeceoclades maculata (Lindl.) Lindl.	DNA	DNA	DNA	II
	Vanilla odorata (C.Presl)	DNA	DNA	DNA	II

*** VU: Vulnerable, SP: Special protection, DNA: Does not apply**

Source: BioAp S.A.S 2015

Wildlife

During the EER and field verification a total of 26 species of fauna listed as HCV were recorded, these species are included in the listings and threatened categories CITES, IUCN or Mexican Official Standards NOM-059-SEMARNAT-2010.

In IUCN list of endangered species, three species, one EN category, one as NT category and one in VU category were found. CITES appendices for 5 species were recorded in appendix I and 10 species in Appendix II. As for the standard NOM-059-SEMARNAT-2010 18 species were included in this list. Table 18 shows the taxonomic distribution of species. The highest taxonomic group was Birds with 14 species, followed by 7 reptile species, 3 mammals and 1 amphibian.

Table 18 Wildlife species diversity found in HCV 1.2 y 1.3 HCV 1.2 Y 1.3

Group	Scientific name	Common name	Nom-059-2011	CITES	IUCN	Zona
Birds	*Ara macao* (Linnaeus 1758)*	Guacamaya roja	P	I	DNA	N
	Amazona oratrix (Ridgway 1887)*	Perico cabeza amarilla	SP	I	EN	N, E, W
	Buteo magnirostris (Gmelin, 1788)	Águila caminera	DNA	II	LC	N, E
	Falco femoralis (Temminck, 1822)*	Halcón fajado	DNA	II	LC	N
	Falco peregrinus (Tunstall 1771) *	Halcón peregrino	SP	I	DNA	E
	Herpetotheres cachinnans (Linnaeus, 1758)	Guaco	DNA	II	LC	N, E
	Pandion haliaetus (Linnaeus 1758)	Águila pescadora	DNA	II	DNA	E
	Caracara cheriway (Jacquin, 1784)	Quebrantahuesos	DNA	II	LC	N
	Buteo nitidus (Latham, 1790)	Aguililla gris	DNA	II	LC	N
	Tigrisoma mexicanum (Swainson 1834)	Garza tigre	SP	DNA	DNA	N, E
	Columbina passerina socorroensis (Linnaeus 1758)	Torcaza	A – Endemic	DNA	DNA	E
	Colinus virginianus ridgwayi (Linnaeus 1758)	Cotui norteño	P – Endemic	I	NT	E
	Amazilia yucatanensis (Cabot, 1845)	Colibrí yucateco	DNA	II	LC	E
	Crotophaga sulcirostris pallidula (Swainson, 1827)	Garrapatero pijuy	Endemic	DNA	DNA	W
Mammals	*Alouatta pigra* (Gray 1849)*	Mono aullador	P	I	EN	N, E, W
	Conepatus semistriatus conepati (Boddaert 1784)*	Zorrillo	Pr - Endemic	DNA	DNA	N, E, W
	Tayassu pecari (Link 1795)*	Pecarí	P	DNA	DNA	N
	Mazama pandora (Merriam 1901)*	Venado o temazate	DNA	DNA	VU	E
Reptiles	*Iguana iguana* (Linnaeus 1758)*	Iguana verde	SP	II	DNA	N, E, W
	Corytophanes hernandezi (Wiegmann 1831)	Teterete pardo	SP	DNA	DNA	N, E, W
	Boa constrictor (Linnaeus 1758)	Uxcan o boa	A	II	DNA	N, E, W
	Crocodylus moreletii (Duméril y	Cocodrilo de	SP	II	LC	E

Group	Scientific name	Common name	Nom-059-2011	CITES	IUCN	Zona
	Bibron 1851)*	pantano				
	Ctenosaura acanthura (Shaw 1802)	Iguana negra	SP – Endemic	DNA	DNA	E
	Thamnophis proximus (Say 1823)	Culebra hojarasquera	A	DNA	LC	E
	Laemanctus serratus serratus (Cope 1864)	Teterete verde	SP	DNA	DNA	E
Amphibians	*Lithobates brownorum* (Sanders 1973)*	Rana café leopardo	SP - Endemic	DNA	DNA	N, W

*** VU: Vulnerable, P: Protected, SP: Special protection, EN: Endangered, LC: Low concern, NT: almost threatened, DNA: Does not apply, N: North zone, E: East zone, W: West zone**

Source: BioAp S.A.S 2015

Records from HCV species 1.2. and 1.3 were conducted in natural vegetal coverage that were present at the study area, so for the definition of HCV 1.2 and 1.3 areas were taken into account all areas that have a high natural vegetation successional degree. From Figure 45 to Figure 48 the HCV 1.2 and 1.3 areas for North, East and West zone are presented. Equally points or areas proposed to be maintained (AMHCV 1.2 and 1.3) and biodiversity monitoring are presented.

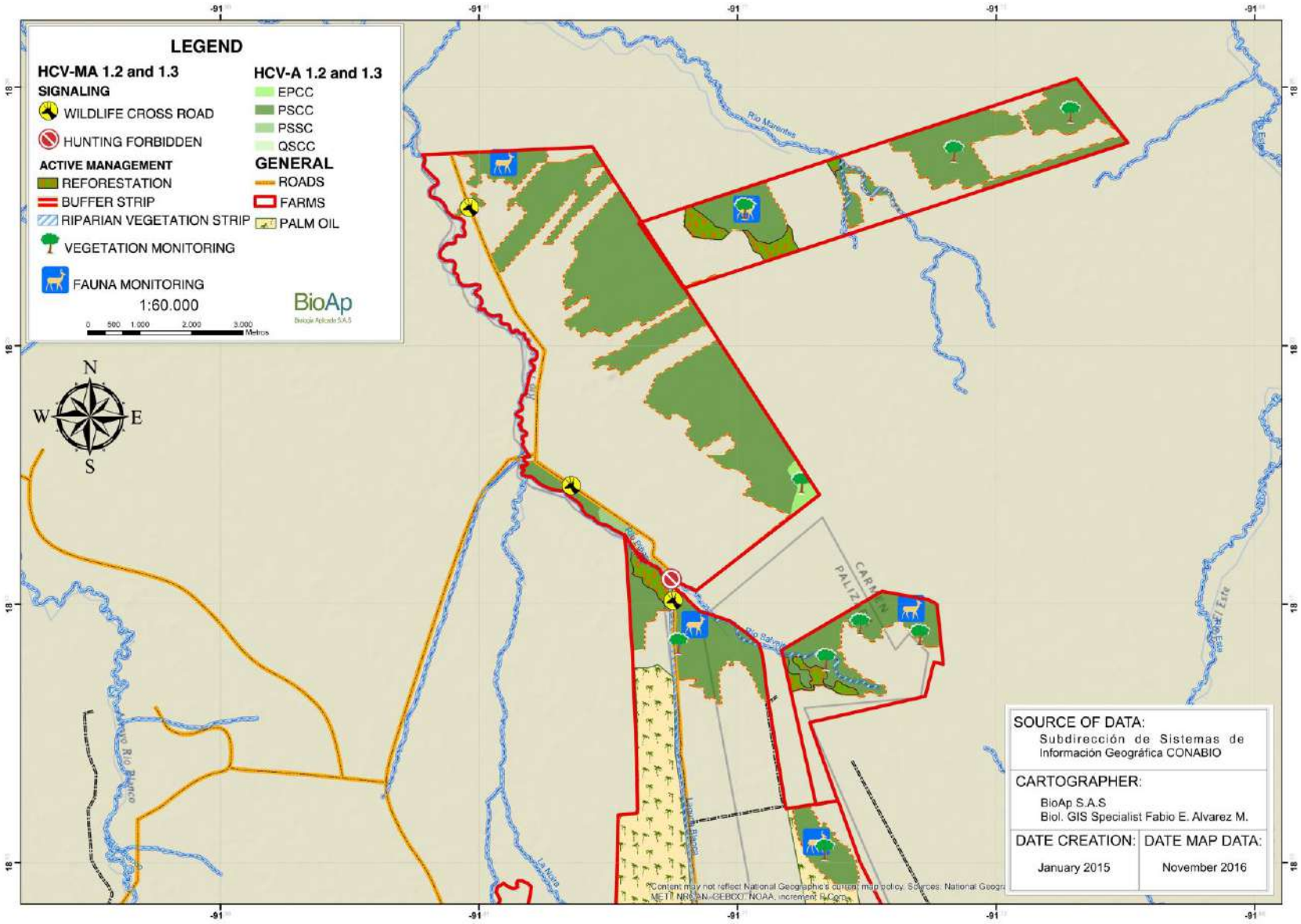


Figure 45.HCV 1.2 y 1.3 North Zone (a)

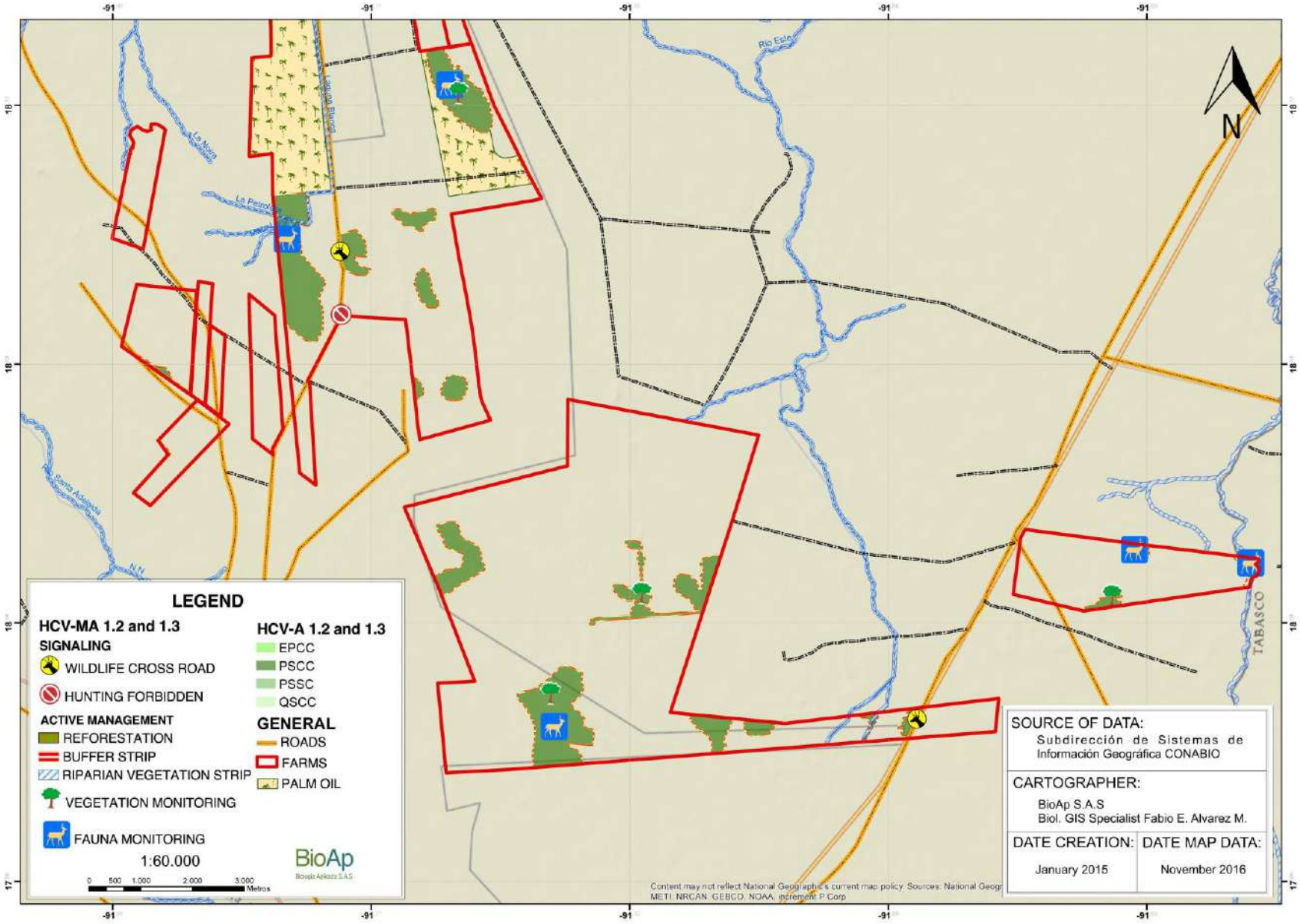


Figure 46.HCV 1.2 y 1.3 North Zone (b)

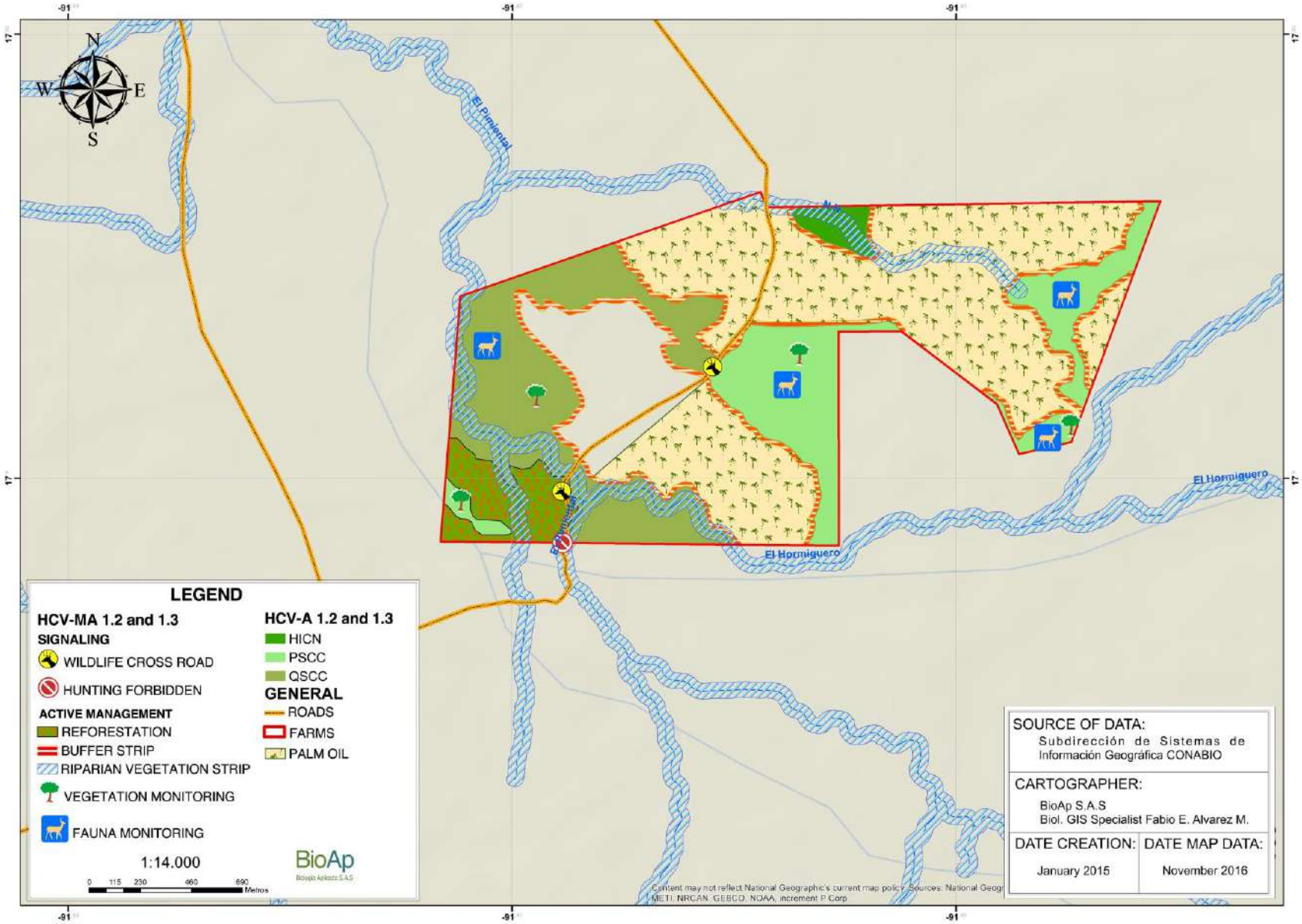


Figure 47.HCV 1.2 y 1.3 East Zone

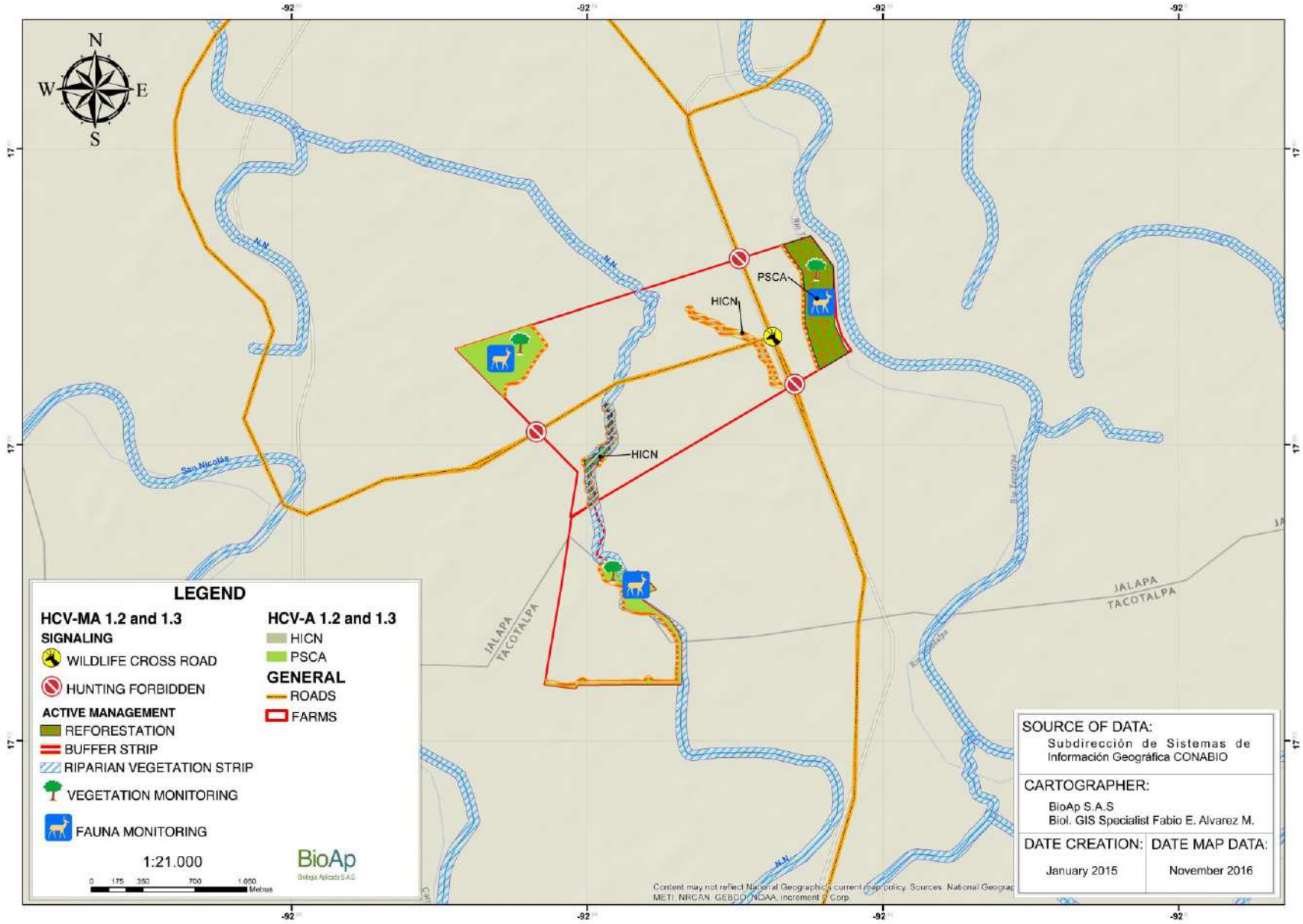


Figure 48.HCV 1.2 y 1.3 West Zone

3.3.9.3 HCV 2. Large scale landscape ecosystems with global, regional and national significances

Within the projects influence area at the North zone, two main ecoregions were identified. Despite the high intervention and fragmentation of the ecosystem, the area keeps a continuous length of natural vegetation coverage, which was level IV ecoregions (high evergreen forest of the coastal Gulf and Wetlands of southern Gulf of Mexico). This ecoregions are part of Level I ecoregion (Tropical-humid Forest). In Mexico´s Level I ecoregion more than 1650 species of terrestrial vertebrates are distributed, from which 17.7% approx. are at risk, as stated by the red lists from NOM-059-SEMARNAT-2010 y la UICN (2015). According to the review made by Urquiza-Haas et al. 2011, the ecoregion shows a large number of species that represent a key factor for the ecological function they perform, standing out among others the howler monkeys (*Alouatta pigra, A. palliata*), the spider monkey (*Ateles geoffroyi),* tapir (*Tapirus bairdii*), the toucan (Ramphastos sulfuratus), the harpy eagle (Harpia har- Pyja), the ocellated turkey (Meleagris ocellata) and crocodiles (Crocodylus moreletii and C. acutus). This region shows high pressure by natural resources overexploitation due to maintenance and livelihoods of local communities.

For HCV 2 determination, coverage vegetation layers were cross-linked (Inegi, 2013) using ecoregions mapping from IV level. The current area continuous natural vegetation which make part of these ecoregions was defined as HCV 2 (Figure 49). Within the natural hedges present in the estates relicts of vegetation were found belonging to those level IV ecoregions (Figure 50 and Table 19). These forest patches display mostly connectivity with the rest of the continuous vegetation. These areas were defined as AMAVC 2.

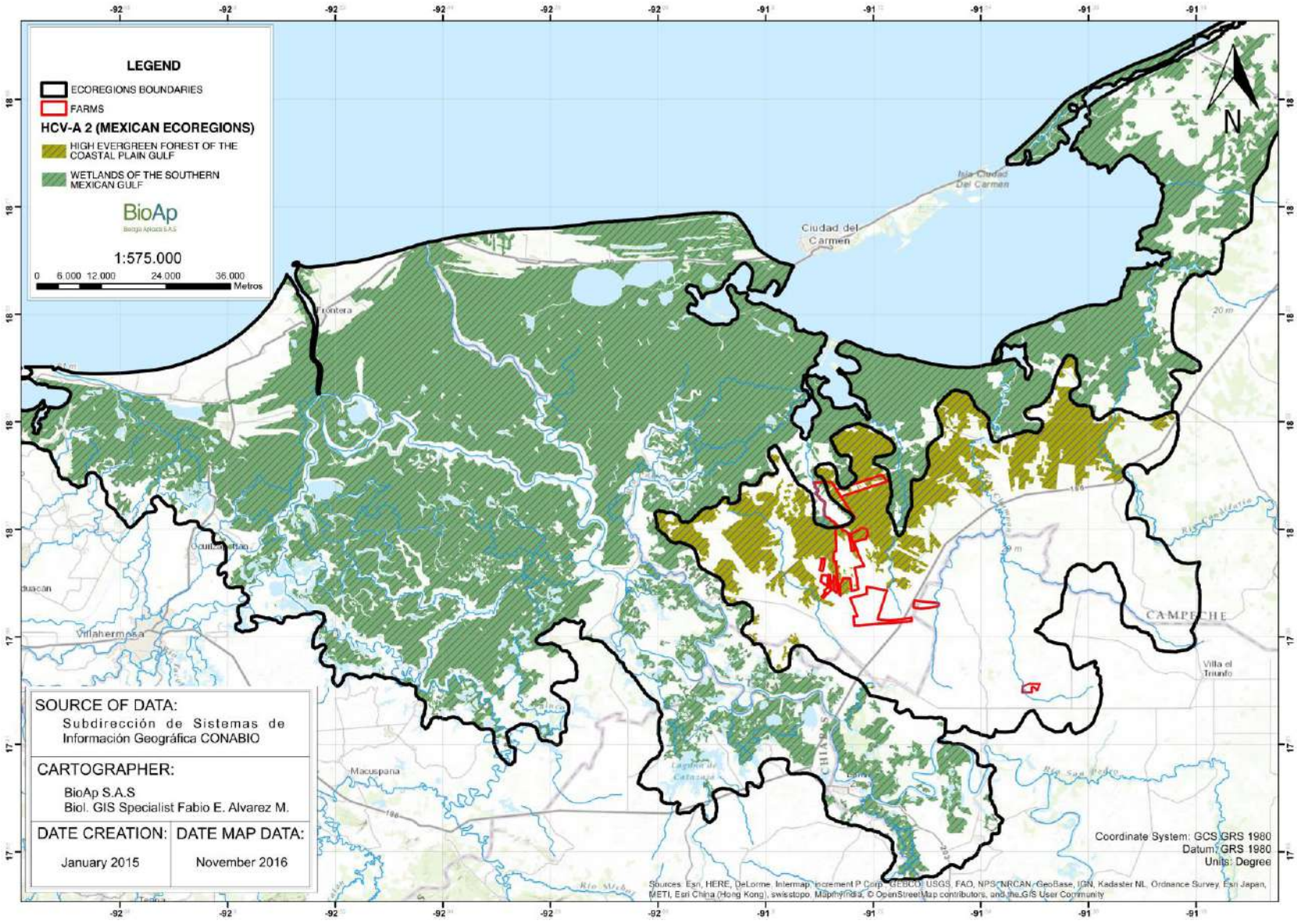


Figure 49. Ecosystem –scale landscape in the study area

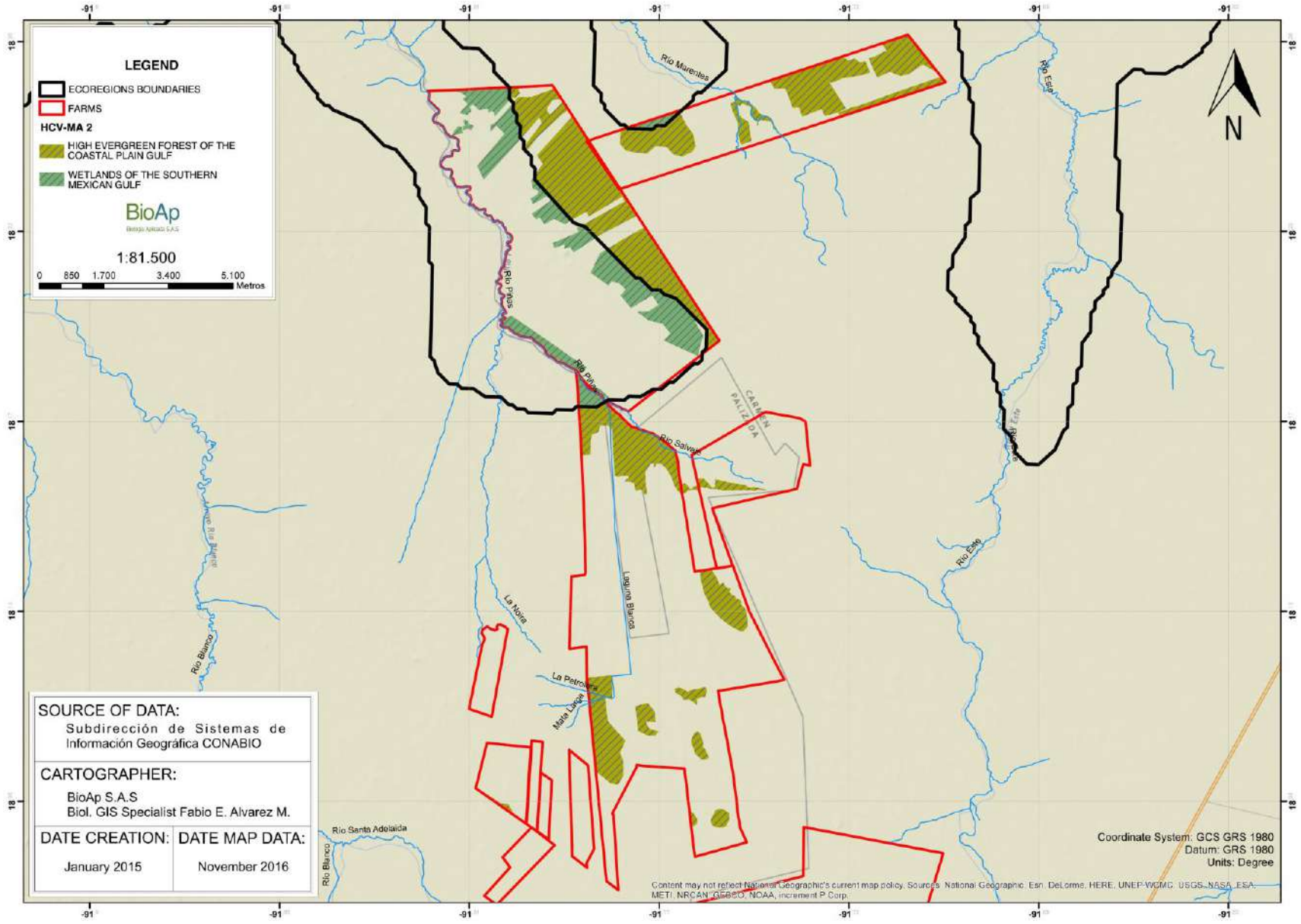


Figure 50.HCV. Ecosystem –scale landscape in the study área. North Zone

Table 19. Ecoregion found in the study area

Ecoregion	Ecosystem´s Kind	Coverage	Area Ha
High Evergreen forest Coastal Gulf Plain	Spined forest	Primary	16,70
High Evergreen forest Coastal Gulf Plain	Evergreen forest	Secundary	1844,76
Gulf of Mexico Wetlands Southern	Evergreen forest	Secundary	586,78

Source: BioAp S.A.S 2015

3.3.9.4 HCV 3. Treathened and endangered areas

Threatened ecosystems*:* Tropical Rainforest (TRF) and Tropical Dry Forest (BTS) Crossing of information between the thematic layers, ecosystems and natural coverage was developed (1. Rainy Forests, Dry Forests, 3. Priority hydrological regions and 4. Terrestrial priority regions). States that concurred with some of the evaluated layers belong to the North Zone.

El Zapote, Jorge Ayala and Gustavo Ferrer estates showed rainforest remnants and dry forest as well. At the same time, North zone properties, except for R. Blankenship and Las Pampas, were located on the Priority Hydrologic Area of Laguna de Terminos – Pantanos de Centla (Figure 51).

The remaining areas of Forests and Dry Forest are considered, as HCV management areas should implement management plans that include reforestation, restoring connectivity and species monitoring. Installation of permanent plots to evaluate the progress of these remnants of vegetation is also proposed (Figure 51)

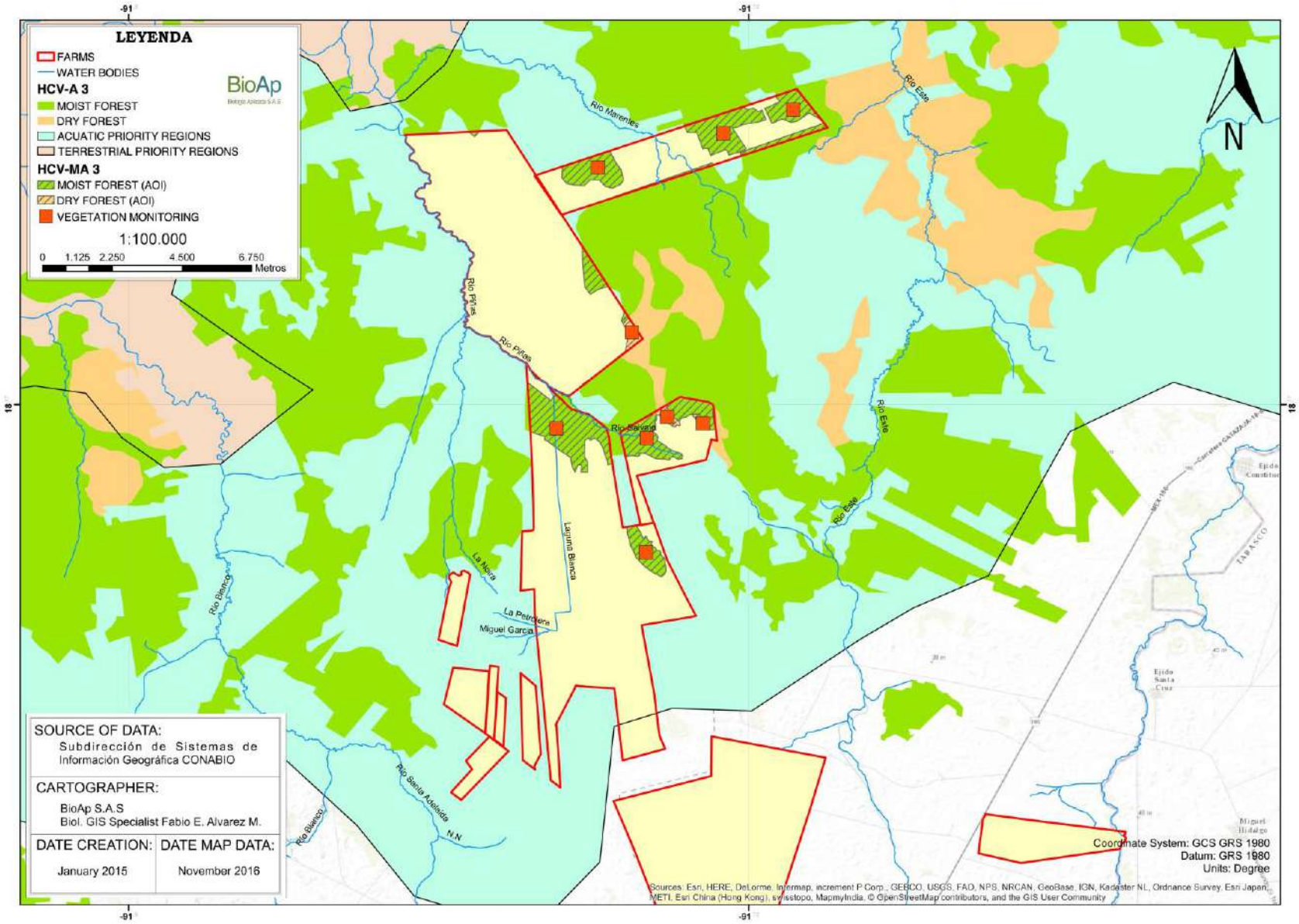


Figure 51.HCV 3. Threatened ecosystems and conservation priorities

3.3.9.5 AVC 4. Ecosistemic Services

HCV 4 category refers to areas which provides basic ecosystem services in critical situations. These are defined as “services that benefit people obtained from the ecosystems”. There are two types of benefits: direct and indirect. Direct benefits refers to water and food production supplies, or cycles regulation such as flooding, soil degradation, water pollution, desiccation and salinization, pests and diseases (regulation services). 5 main sub-basins were identified Inside the project`s influence area which have influence over the area, this were included within this HCV, and make reference to:

- North Zone: Laguna del este, Chumpan river y Palizada River.
- Southwest Zone: Sierra`s river y Tacotalpa river.
- East Zone: Chumpan River.

Description for each of the affluent by zone are described as follows

1.1.1.1.1.1.1 North Zone

A total of 34173.48m were identified as drainage at the evaluated estates in the north zone, in total there can be found 11 effluents for this area. Piñas River shows the larger extension having 11555.10m^2 for this area. Table 20 identifies length and extension for each water body and Figure 52 shows its distribution.

Table 20. Drainage extension in the assessed areas. North Zone

North Zone Drainage		
Estate	**Name of Water Body**	**Lenght m^2**
El Zapote	Rio Piñas	11555,10
Jorge Ayala	Laguna Blanca	9623,36
Jorge Ayala	La Petrolera	420,02
Jorge Ayala	Mata Larga	456,83
Jorge Ayala	Miguel García	128,83
El Zapote	Rio Salvaje	216,39
Entre Zapote Y Jorge Ayala (Seccion1)	Rio Salvaje	160,52
El Zapote	Rio Salvaje	60,75
Entre Zapote Y Jorge Ayala (Seccion2)	Rio Salvaje	996,09
Jorge Ayala	Rio Salvaje	1149,42
Entre Jorge Ayala Y Plan De Ayala	Rio Salvaje	510,34
Plan De Ayala	Rio Salvaje	2247,16
Blakenship	Rio Este (Brazo Occidental)	666,91
Blakenship	Rio Este (Brazo Oriental)	567,10
Gustavo Ferrer	Rio Marentes	2083,87
Gustavo Ferrer	N.N (Brazo Rio Marentes)	1637,99
Las Pampas	N.N	766,70
Luis Ayala Tribuna	N.N (Brazo La Noira)	926,11
Total		**34173,48**

Source: BioAp S.A.S 2015

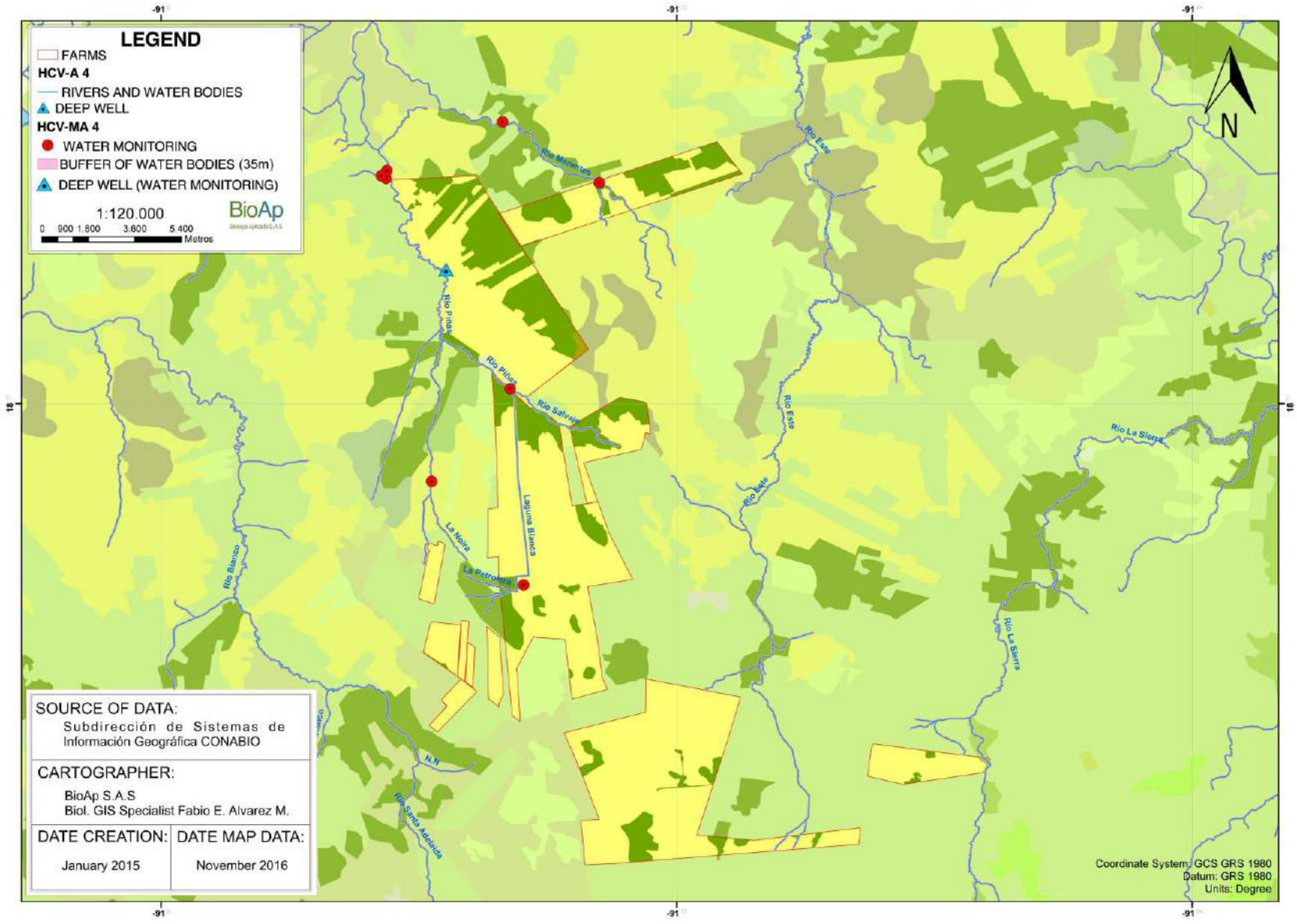


Figure 52.HCV 4. Basic ecosystemic services. North Zone

1.1.1.1.1.1.2 West Zone

Three water influents were identified into the west zone having a total length of 4118.18Ha (Table 21), from which N.N 1 has the longest extension with 1684, 78m^2. N.N 2 and Rio de la Sierra were also identified as two main influents having 1594.43 and 838.97 respectively. Figure 53 shows other influent lengths inside the West Zone.

Table 21 Drainage extensión in the assessed areas. West Zone

West Zone Dreinage		
Estate	**Name of Water Body**	**Lenght m^2**
Jalapa	N.N 1	1684,78
La Pampa	N.N 2	1594,43
Jalapa	Rio La Sierra	838,97

Source: BioAp S.A.S 2015.

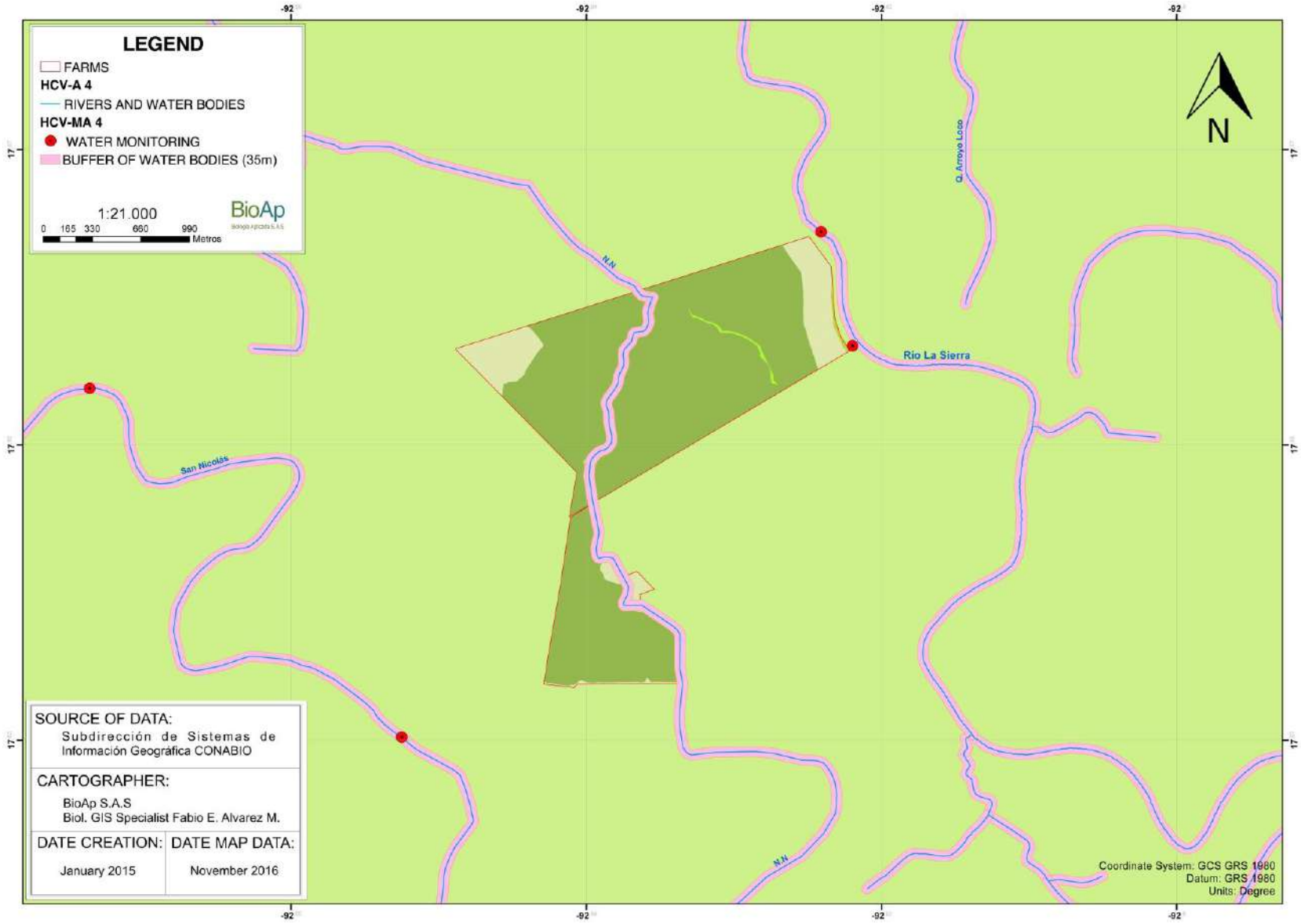


Figure 53. Basic ecosystemic services. West Zone

1.1.1.1.1.1.3 East Zona

In this estate, 4 water bodies were identified with a total length of 4456.99m^2, Caño Hormiguero occupies the longest extension with 2289.87m^2 followed by N.N with a length of 1449.50m (Table 22**)**. Figure 54 shows water bodies distribution in the assessed area.

Table 22 Drainage extensión in assessed áreas. East Zone

East Zone Dreinaje		
Estate	**Name of water Body**	**Lenght m^2**
El Recreo	El Hormiguero	2289,87
El Recreo	N.N (Brazo Hormiguero)	512,56
El Recreo	El Pimiental	205,06
El Recreo	N.N	1449,50
Total		**4456,99**

Source: BioAp S.A.S 2015.

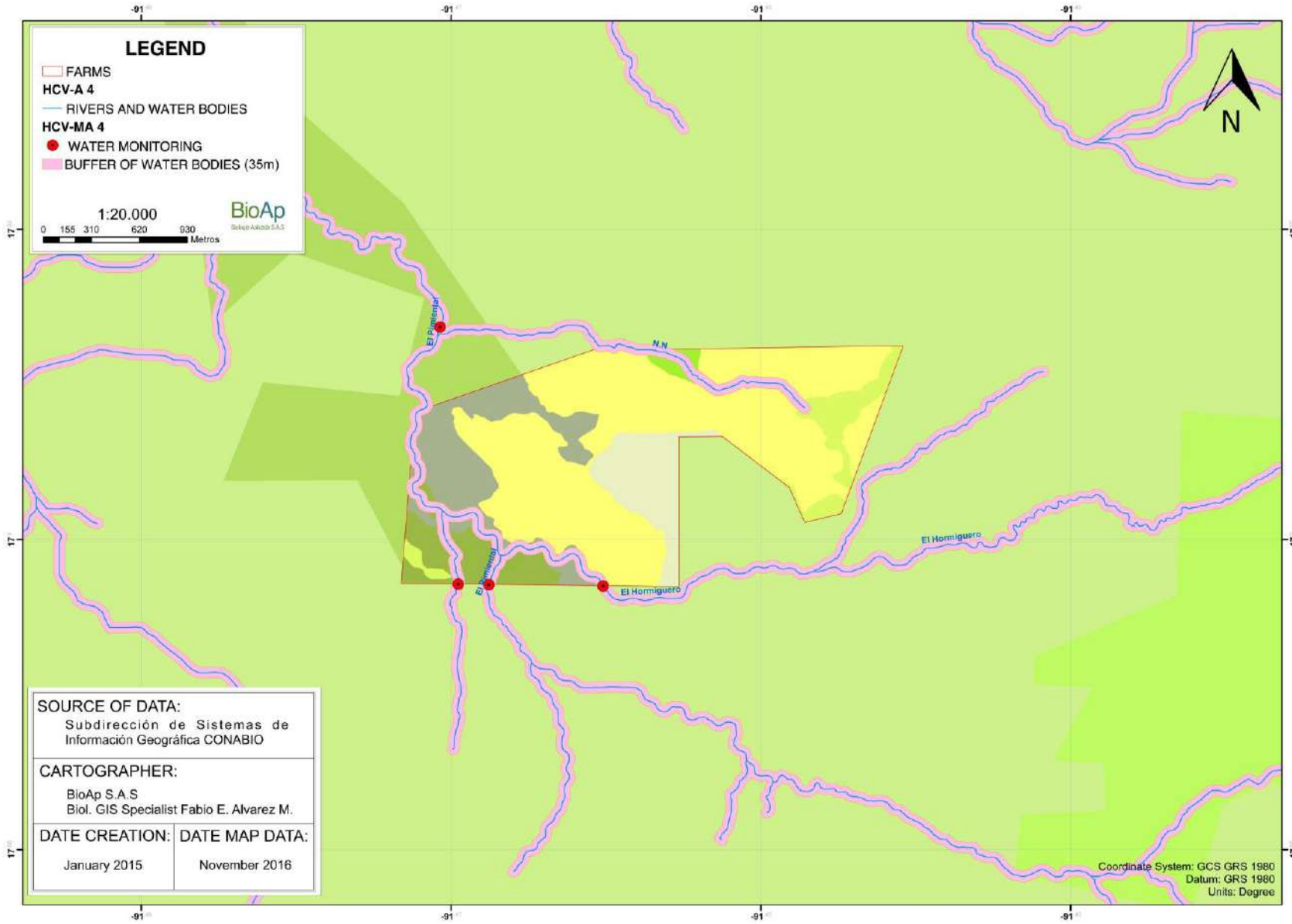


Figure 54. Basic ecosystemic services. East Zone

3.3.9.6 HCV 5 Communities Basic Needs

84 flora species could be identified using the QEE and the field verification during interviews made to the communities. This species are still recognized by local communities as important for its traditional use. Given the precautionary principle these species were defined as potential AVC 5. Although these species is not used by the communities, it is necessary to perform a thorough verification by conducting an ethnobotanical survey to establish these species true relationship with local communities and whether or not it's critical for their basic needs.

Fuel, construction wood, ornamental, medicinal and food were the main uses found for these species.

3.3.9.7 HCV 6

Collecting information on local, national and global scales carried out HCV 6 presence evaluation.

Locally was assessed by participatory consultations and interviews with local communities in the evaluated areas. It was concluded that there are neither places nor resources with any historical, religious or spiritual significance, referring to old cemeteries, rock engravings and vestiges of indigenous settlements. About global or national scales, no sites with high cultural value, UNESCO sites, or places with historical, archaeological and religious values were found.

1.1.1.1.1.1.4 Ceiba pentandra

The presence of the species *C. pentandra* was identified. Mayan culture uses it and presents both cultural and traditional values. This species was recorded thanks to interested parties consultations at the land of common usage called Playa Larga and also at field´s QEE in Zapote and Recreo estates.

Ceiba or *Yaxché* as it's called in Mayan language, is native from Central America. Ceiba extends from southern Mexico to Venezuela, Brazil and Ecuador. This species grows in water bodies margins, often grows in deforested areas and along roads. This is a majestic tree and is one of the largest in Tropical America, deciduous, up to 70 m of height and up to 30 m of circumference. Some uses were identified for this species: edible, timber-yielding, cosmetic, fodder, medicinal, rituals and for Ceiba tree is legendary and as it had a strong totemic significance in regions where Mayan families were distributed. It is considered as a sacred and indestructible tree, which represented the union between heaven and the underworld, and wind and rain god. Mayan communities continue to identify the Ceiba, as a strength and wisdom force (Conabio - Conafor, 2001). It is necessary to start prompt recordings and identification from *C. pentandra* individuals in the areas of the evaluated estates.

1.1.1.1.1.1.5 Management and monitoring

Table 23 shows management and monitoring recommendations for each of the six identified attributes.

Table 23 Management and monitoring plan for each identified HCV.

HCV	HCV-Identified	A-HCV	Management	AM-HCV	Monitoring
1.1	Laguna de Terminos Protection area	Laguna de Terminos Protection area	Type II and III agrochemicals usage moderation. Type I must not be used.	Palm growing areas at the North zone. Water quality monitoring from key water bodies.	Develop water quality analysis using physical and chemical parameters: pH, dissolved oxygen, chlorides, sulfates, nitrogenated compounds, Coliforms (fecal and total) and BOD. As well as hydrobiologic analysis such as: macroinvertebrates and fish fauna, on an annual basis.
			Apply agrochemicals and fertilizers in dry seasons.		Keep a written control about applications dates.
			Native species reforestation	Reforestation Zones (same as HVCMA 1.2)	Monitor growth of seedlings each month during the first year and second year every three months in order to ensure the survival of individuals. Biannual monitoring of focal flora groups with a multi temporal analysis of vegetation coverage through the establishment of permanent plots.
1.2	14 bird species, 4 mammal species, 7 reptile species and 1 amphibian species.	Natural vegetation coverage that were identified inside the estates.	Active management: Native species reforestation. Intercalated between each other so forest area could increase. Perform transects to assess the state of the coverage.	Reforestation zone	Monitor plant growth every month during the first year and second year every three months in order to ensure the individuals survival. Biannual monitoring of flora focal groups with a multi temporal analysis of the vegetation coverage. Perform bi-annual wildlife monitoring (mammals, birds, reptiles and amphibians) taking into account hedges present in the area in order to assess the status of HCV species populations and confirm the presence of HCV species with potential distribution for the area. Keep track of wildlife sightings made by plantations employees.
	20 mammal species with some threat grade which are potentially distributed inside the study area.		Implement buffer and natural barrier zones with fast-growing native plants, intercalating species when sowing.	20m protection fringe zone between the last line of palm and the edge of the forest coverage to allow forest regeneration in the secondary vegetation coverage and avoid the influence of farming activities on natural hedges.	
			Signaling and construction of wildlife crossings.	Main and secondary roads	Keep records of dates, photos and places where runover and usage records/transit through the wildlife crossings. Annual signaling maintenance.

HCV	HCV-Identified	A-HCV	Management	AM-HCV	Monitoring
	10 *Orchidaceae* species, 1 *Fabaceae* species, 1 *Cactacea* species, 1 *Meliaceae* species.		Implementation of a NO hunting and No fishing policy, internal and external environmental education and sensitization. Biosafety training to employees for the proper wildlife management and handling.	Local communities (educational institutions, social organizations, etc.) and employees.	Registration activities with communities and groups of employees. Wildlife encounters in the company´s facilities and plantations registration.
			Promote the usage of natural pesticides.	Sowing and infrastructure areas.	Keep track of the use of chemical pesticides.
	6 endemic wildlife species.		NO logging NO burning policy. Passive vegetation management (allows regeneration and natural revegetation of wooded areas)	Areas with natural vegetation coverage and forest remnants.	Floras biannual monitoring. Semiannual monitoring (visit) to verify forests status.
2	Natural areas which belong to the following ecoregions: southern Gulf of Mexico´s wetlands and high evergreen forest of the Gulf´s coastal plain.	Natural areas which belong to the following ecoregions: southern Gulf of Mexico´s wetlands and high evergreen forest of the Gulf´s coastal plain.	Passive vegetation management (allows regeneration and natural revegetation of wooded areas). Active management: Intercalated native species reforestation in order to increase the area. Transects development in order to assess coverage status.	Vegetation coverage remnants which belong to following ecoregions: southern Gulf of Mexico wetlands and high evergreen forest of the Gulf´s coastal plain	Monitor plant growth every month during the first year and second year every three months in order to ensure the individuals survival. Biannual monitoring of focal flora groups with a multi temporal analysis of vegetation coverage through the establishment of permanent plots.
3	Areas belonging to rainforests and dry forest ecosystems, primordial aquatic regions and primordial terrestrial regions.	Areas belonging to rainforests and dry forest ecosystems, primordial aquatic regions and primordial terrestrial regions.	Active management: Intercalated native species reforestation in order to increase the area. Permanent plots establishment.	Rainforests and dry forests and areas where flora monitoring should be performed.	
			Implement buffer and natural barrier zones with fast-growing native plants, intercalating species when sowing.	20m protection fringe zone between the last line of palm and the edge of the forest coverage to allow forest regeneration in the secondary vegetation coverage and avoid the influence of farming activities on natural hedges.	

HCV	HCV-Identified	A-HCV	Management	AM-HCV	Monitoring
4	Piñas River, Marentes River, Salvaje River, Caño Laguna Blanca, La Noira River and groundwater collection wells.	35 meters protection buffer on each margin of the affluent: Piñas River, Marentes River, Salvaje River, Caño Laguna Blanca, La Noira River and groundwater collection wells.	Apply agrochemicals and fertilizers in dry seasons	Water quality monitoring points on key water bodies.	Develop water quality analysis using physical and chemical parameters: pH, dissolved oxygen, chlorides, sulfates, nitrogenated compounds, Coliforms (fecal and total) and BOD. As well as hydrobiologic analysis such as: macroinvertebrates and fish fauna, on an annual basis.
			Forbid the wastes disposal in water bodies. Promote a proper management of solid wastes. Install rain gauges to be aware of the cubic mm of rain	Install rain and water level gauges.	Waters annual monitoring: physico-chemical and hydrobiological. Generate a database with daily rainfall data and water body levels to see the annual tendency.
5	Flora species identified as useful for the communities in the area of influence.	Natural vegetation coverage areas.	Perform an ethno botanical study to confirm the presence or absence of these species as HCV5	Natural vegetation coverage, local communities.	N/A
6	Ceiba o Yaxché (*Ceiba pentandra),* Mayas´ sacred tree	Species distribution areas	NO logging NO burning policy. Passive vegetation management (allows regeneration and natural revegetation of wooded areas). Seedlings identification and maintenance.	Species distribution areas	Individuals and populations monitoring.

3.4 Soil and Topography Findings and Results

Most of the territory is a plain that extends from Sierra de Chiapas piedemont to sea shore, there are close to no elevations and those present do not exceed 30 m. high; this is confirmed by performing slope modeling. The results of said exercise determine that none of the properties where project implementation will take place have any slopes exceeding a 5 ° inclination and that the constant of the areas is of about 2 °, as shown in Figure 55.

For the specific case of the Northern Zone, it is possible to identify that soils associated with bodies of water are more vulnerable than in other areas due to the synergy between the slope of its banks and the effect generated by water erosion; these results are presented in Figure 55.

It is important to clarify that only the soils from the banks of bodies of water present in the area of direct influence of the properties are identified as vulnerable and the action plan regarding this issue is defined in the EISA and AVC studies.

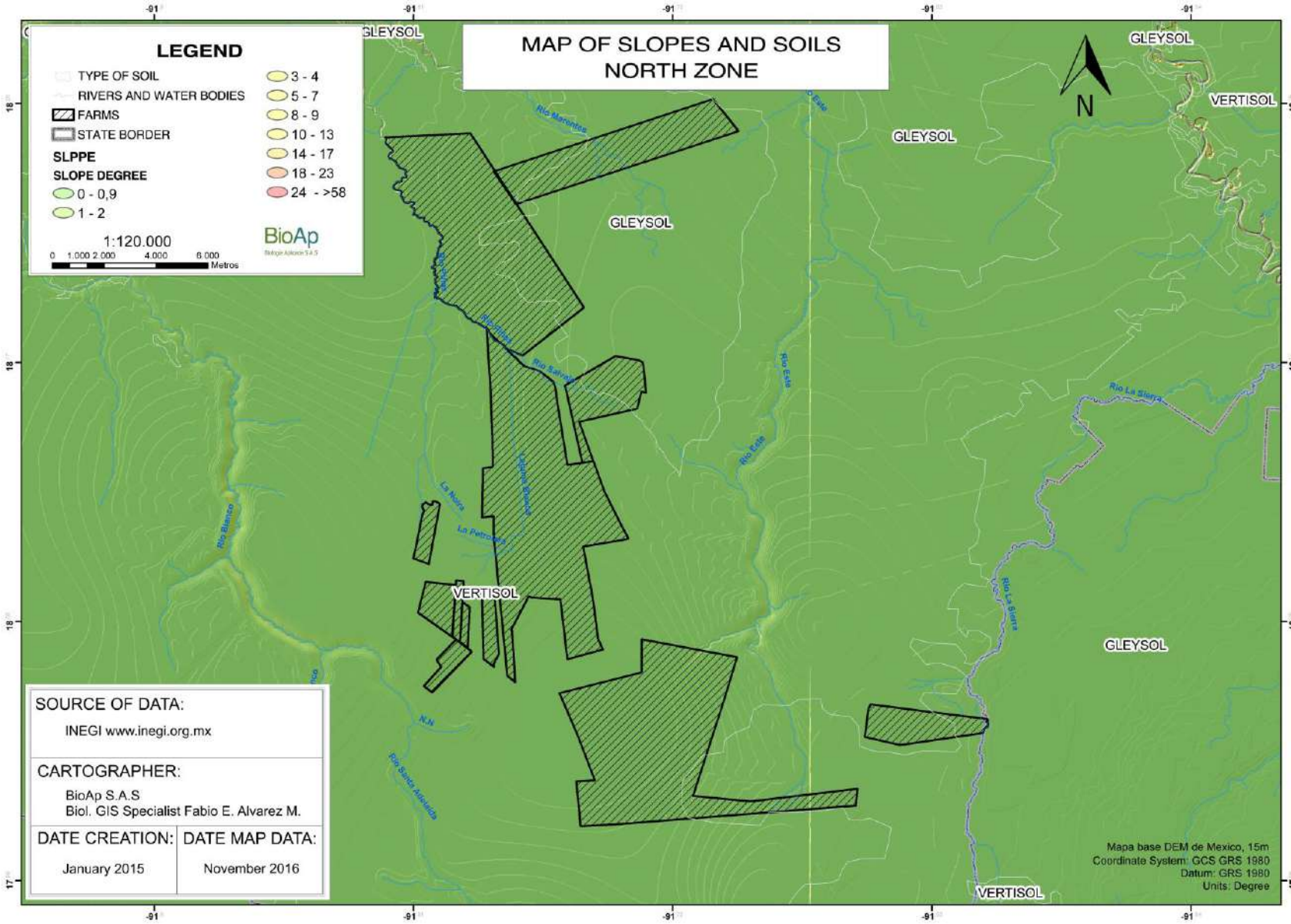


Figure 55. Areas of soil vulnerability for the Northern zone

In the case of the Western zone, only soils in the banks of the Tacotalpa river that have an inclination greater than 24 ° degrees and a high vulnerability in mass movements are identified. These results are presented in Figure 56. For this evaluation area it was determined that all soils associated with bodies of water present high vulnerability.

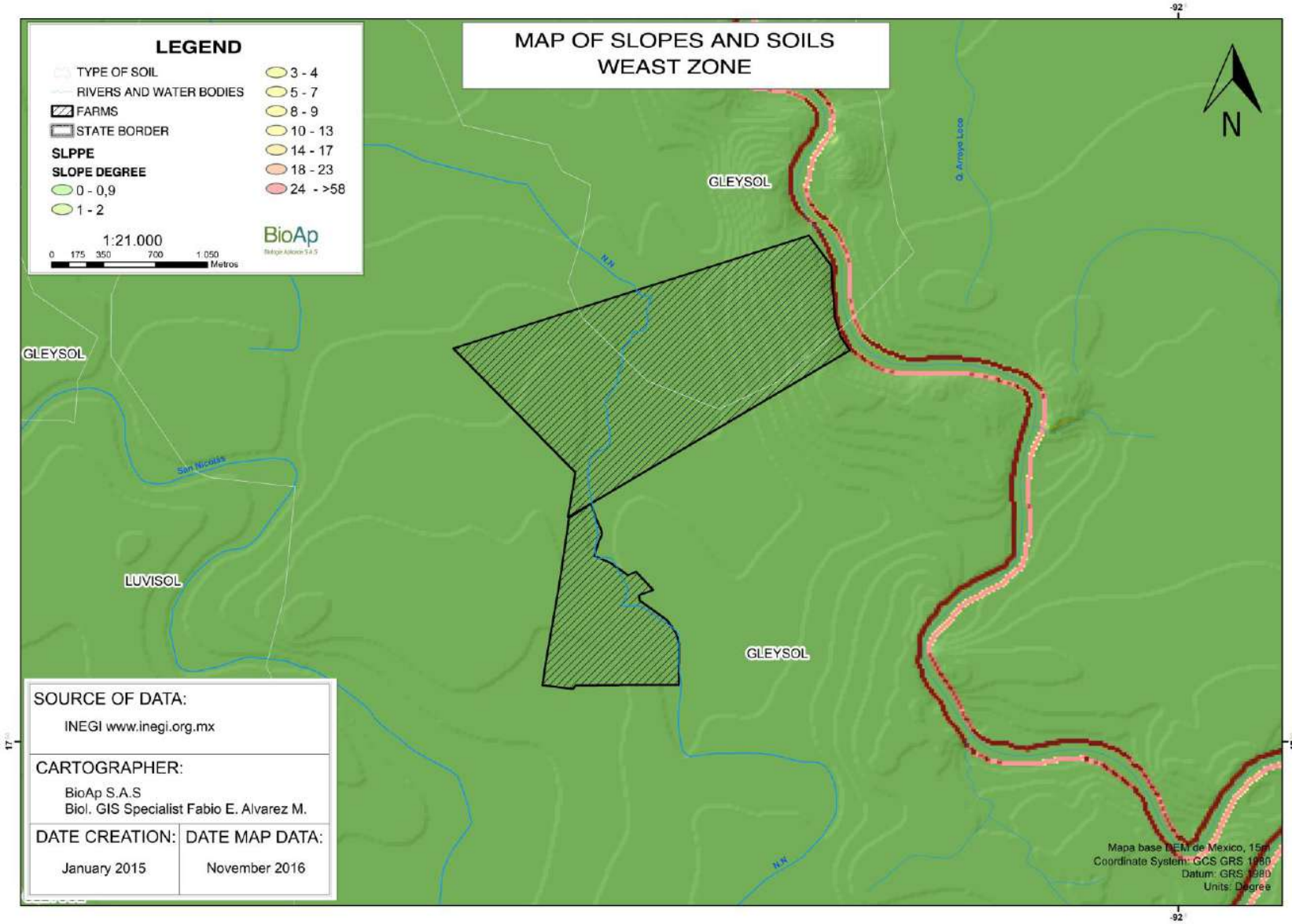


Figure 56. Areas of soil vulnerability for the Western zone

In the case of the Eastern zone, only vulnerable soils that are associated with bodies of water (Figure 57) are identified; these soils are under the effect of water and generate erosion in their banks.

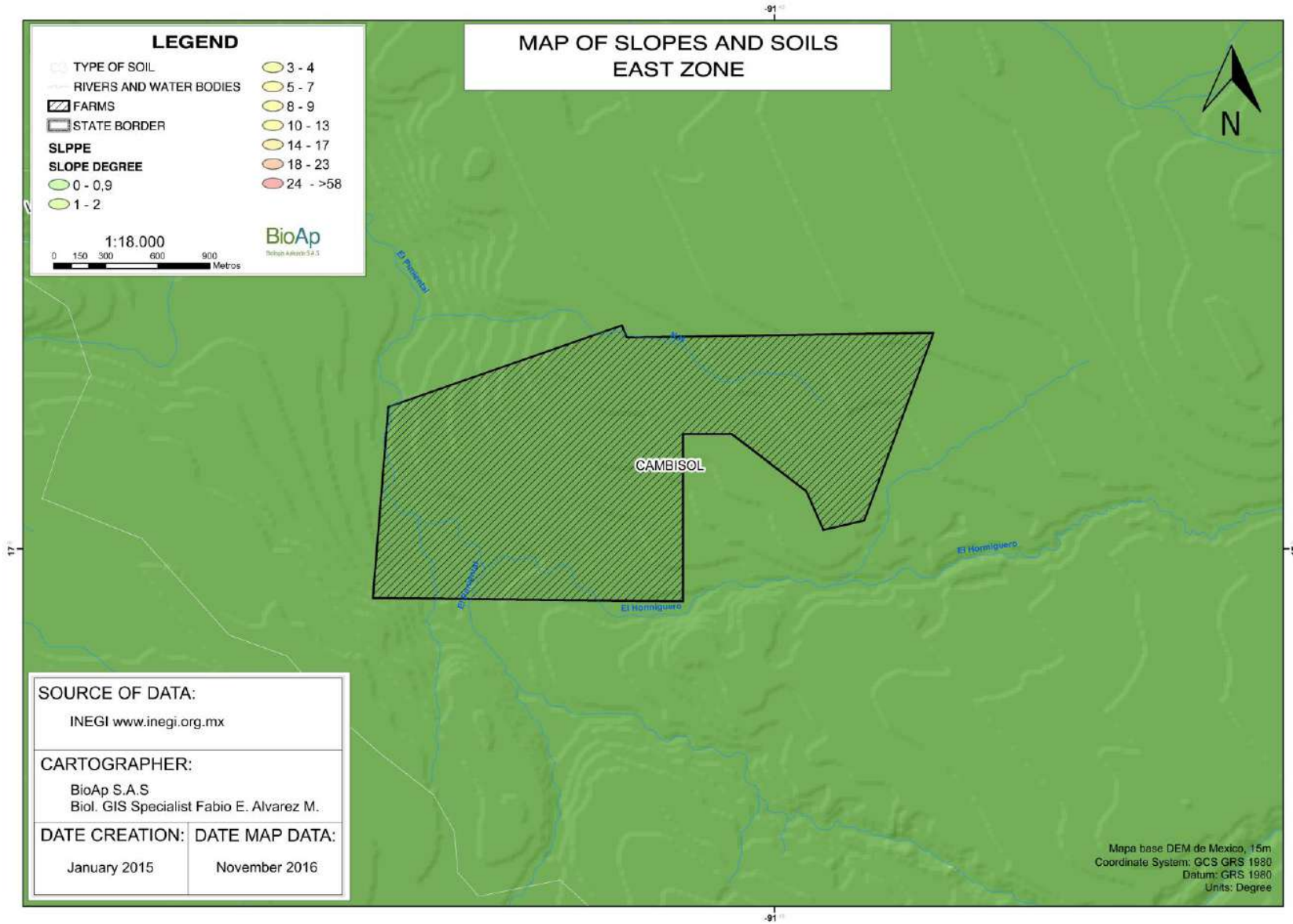


Figure 57. Areas of soil vulnerability for the Eastern zone

It is important to mention that all identified areas with vulnerable soils are found on the banks of bodies of water and main rivers (Tacotalpa river). It is for this reason that it is imperative that management plans developed in the Estudio de Impacto Socio Ambiental (EISA) as well as the High conservation Value (HCV) studies be implemented in these areas where the conservation of hydrophilic vegetation and amortization areas within plantation zones are considered key issues.

3.5 GHG Findings and Results

Table 24 summarizes the main results of the GHG Analysis and describes the scenario considered for development of new plantations.

The land cover type selected for new developings is Grassland; therefore we only use 5 as default value (tC/ha). Nevertheless information about the type of land cover on each ground is available in Table 26.

Table 24. Summary of the main results of the GHG Analysis

Zone	Ground	Municipality	Total Area (ha)	Potential Planting Area (ha)	% Potential Planting Area	HCV Area (ha)	% HCV Area	TYPE_INFO / *t C/Ha	TOT TC	**GHG Emissions
Northern	Plan de Ayala	Carmen	568,12	310,5	54,65	257,62	45,35	Grasslands / 5	1552,5	729,675
	Ejido Zapote	Carmen	3086,75	1838,94	59,58	1247,81	40,42		9194,7	4321,509
	Luis Ayala	Carmen	198,48	191,1	96,28	7,38	3,72		955,5	449,085
	Rosendo Chan	Carmen	136,46	136,46	100	0	0		682,3	320,681
	Polo Bayona	Carmen	44,74	44,74	100	0	0		223,7	105,139
	Nicomedes Bayona	Carmen	124,39	121,9	98	2,49	2		609,5	286,465
Western	La Pampa	Jalapa	294,02	253,09	86,08	40,93	13,92		1.265,45	594,7615
	Jalapa	Jalapa								
Eastern	El Recreo	Balancan	328,67	33,37	10,15	295,3	41,62		166,85	78,4195
TOTAL			**4781,63**	**2930,1**	**61**	**1851,53**	**35**		**14650,5**	**6885,73**

TYPE_INFO: Land cover type; **TOT TC:** Total Tonnes of Biomass; **GHG Emissions:** Total Tonnes of Carbon.
(*) RSPO default value (**tC/Ha)** for Grassland cover
(**) Coefficient to determine **GHG Emissions** within Potential Planting Area of every ground is 0,47, which corresponds to the value sugest by PalmGHG (IPCC, 2006).

3.5.1 Carbon Stock Evaluation with RSPO

3.5.1.1 Carbon Stock

Natural and artificial vegetation coverage types work as carbon reservoirs as a result of plant photosynthesis where carbon dioxide is converted into organic material or biomass. Depending on the kind of coverage and the vegetation strata of each species, the proportion of accumulated biomass of each coverage type is defined. Table 25 shows the proportion of carbon fixed by each coverage type according to RSPO (2016).

Table 25 Determination of tons of carbon according to vegetation coverage

No.	Land Cover classes	Default value (tC/ha)
1	Undisturbed forest	268
2	Disturbed forest	128
3	Tree crop	75
4	Shrub land	46
5	Annual/ food crop	8.5
6	Grassland	5

Source: RSPO, 2016

Note*: The results presented in the Table 25 above correspond to aerial biomass and includes tree biomass.

According to the data above, tons of carbon (TC) were quantified by coverage type. These results allow the identification of the highest carbon fixing capacity areas. Table 26 shows the results from the Northern area, including total values of carbon fixation by vegetation cover. In the Northern area, the Undisturbed Forest accounts for a total of 814.577,96 TC. This high value is due to the big area that this coverage occupies, however it showed lower area than Grassland.

Table 26 Total tons of carbon by vegetation coverage in the three Zones.

Zone	Land Cover	Vegetation Type	TOT Area	tC/ha	TOT TC
North	Secundary Oak Forest – QSCC	Disturbed Forest	11,51	128	1473,28
	Agricultural, livestock, forestry Cover - IAPF	Grassland	9910,15	5	49.550,75
	Perennial Secundary Dense Forest -PSCC	Undisturbed Forest	3039,47	268	814.577,96
West	Agricultural, livestock, forestry Cover - IAPF	Grassland	253,15	5	1.265,75
	Secundary Evergreen Forest - PSCA Hydrophilic Vegetation -HICN	Undisturbed Forest	40,10	268	10.746,8
	Wáter bodies –H2O	Water Body	0,77	0	0
East	Secundary Oak Forest – QSCC	Disturbed Forest	81,74	128	10.462,72
	Agricultural, livestock, forestry Cover - IAPF	Grassland	191,86	5	959,3
	Secundary Evergreen Forest - PSCA Hydrophilic Forest -HICN	Undisturbed Forest	54,90	268	14.713,2

Source: BioAp S.A.S., 2016

Thematic mapping was done based in the base information and RSPO Carbon stock estimation (2016) (Figure 58) were a total of 3 coverage types were categorized and their carbon fixing values according to their structural characteristics, floristic diversity and anthropic disturbance, were calculated. These results lead to a zoning of priority areas for conservation according their high fixing carbon values, and a management priority according to their ecosystem importance and ecosystem service as a carbon reservoir. Our results showed that the highest carbon fixing values in the Northern zone are the Undisturbed Forest with a value of 814.577,96 TC.

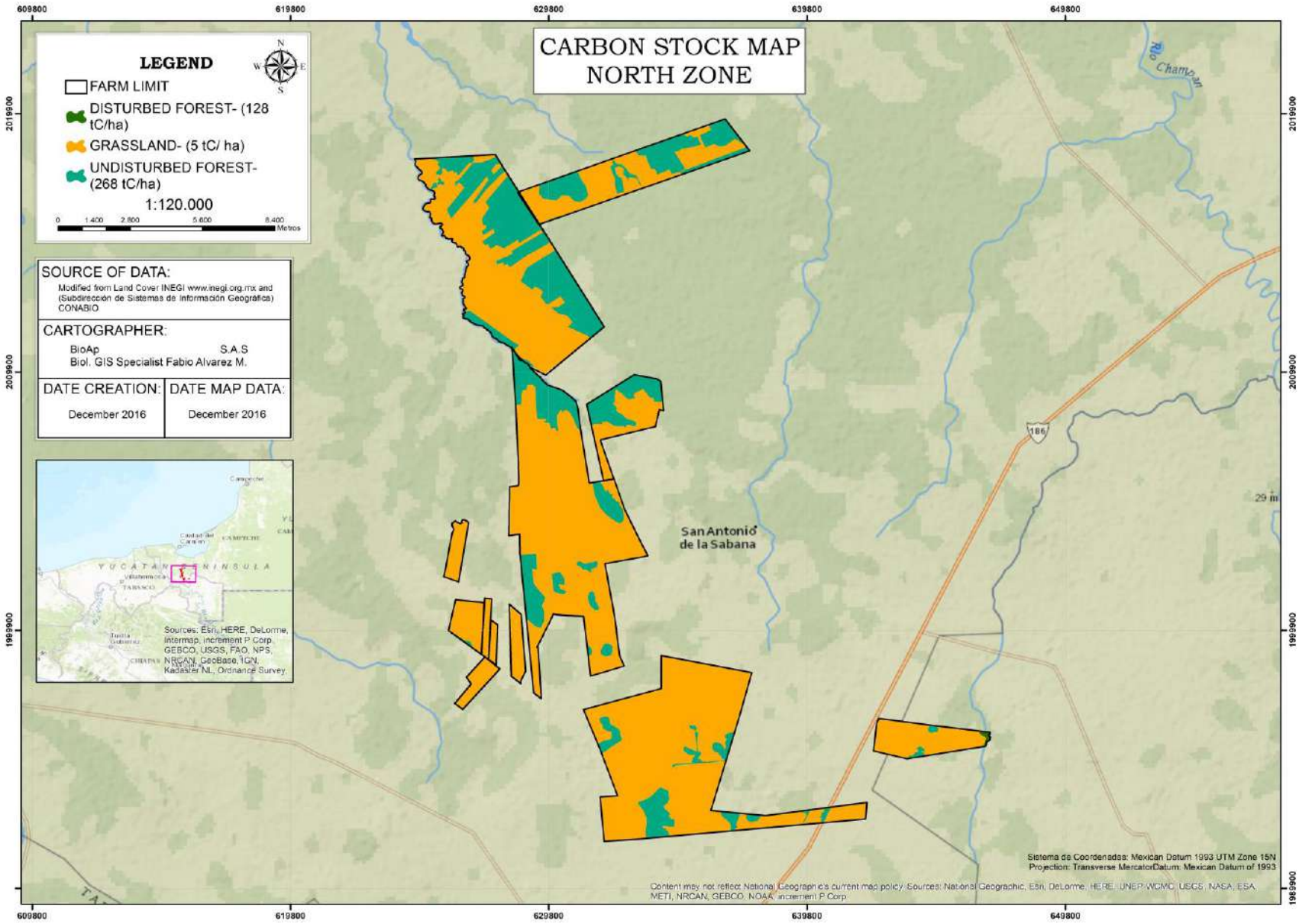


Figure 58. Zoning of carbon stock areas by vegetation coverage in the Northern Area.

Three coverage types were identified in the Western zone, where only two of those are classified as carbon fixing areas according to their vegetation structure, which are responsible for the conversion of carbon dioxide into organic matter or biomass. Figure 59 shows these results in detail. In the Western zone, the highest carbon fixation values were found at the Undisturbed Forest type due to the high tC/ha value with a total of 110.746,8 TC. Introducing palm plantations into these areas, would increase the carbon fixation up to 19.044 TC, which is a positive effect considering the increase in the amount of carbon to be fixed compared to the current coverage type in the area.

Based on the previous results the thematic mapping of carbon fixation was done (Figure 59) where three coverage types were identified and their carbon fixation values were calculated according to their structural characteristics, floristic diversity, and anthropic disturbances. These results lead to a zoning of priority areas for conservation due to their high carbon fixation values, and a management priority due to their ecosystem importance and ecosystem services they provide as biomass storage. Undisturbed Forest and Grassland showed the highest carbon fixing values in the Western zone with a total of 10.746,8 and 1.265,75 TC.

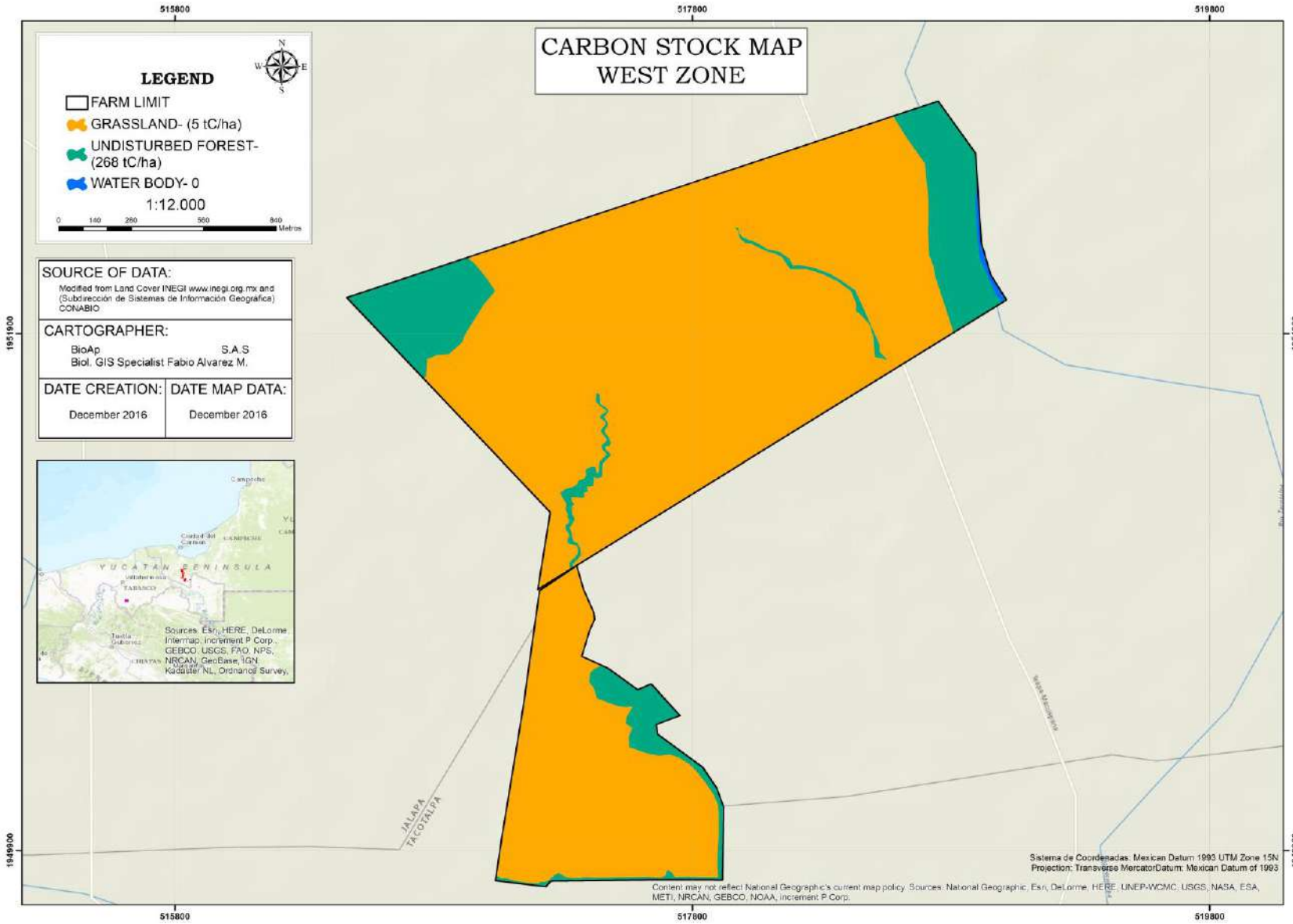


Figure 59. Zoning of carbon stock areas by vegetation coverage in the West Area.

Three coverage types were found in the Eastern zone, including carbon-fixing areas responsible for transforming carbon dioxide into organic matter or biomass, results are shown in Figure 60. The highest carbon fixation by area was found at the Disturbed Forest (10.462,72 TC). If these areas were to be transformed into palm plantations, the carbon fixation would increase to 14.389,5 TC, which can be interpreted as a positive effect.

Based on the previous results the thematic mapping of carbon fixation was done (Figure 60) where three coverage types were identified and their carbon fixation values were calculated according to their structural characteristics, floristic diversity, and anthropic disturbances. These results lead to a zoning of priority areas for conservation due to their high carbon fixation values, and a management priority due to their ecosystem importance and ecosystem services they provide as biomass storage. Disturbed Forest and Undisturbed Forest showed the highest carbon fixing values in the Eastern zone with a total of 14.713,2 and 10.462,72 TC.

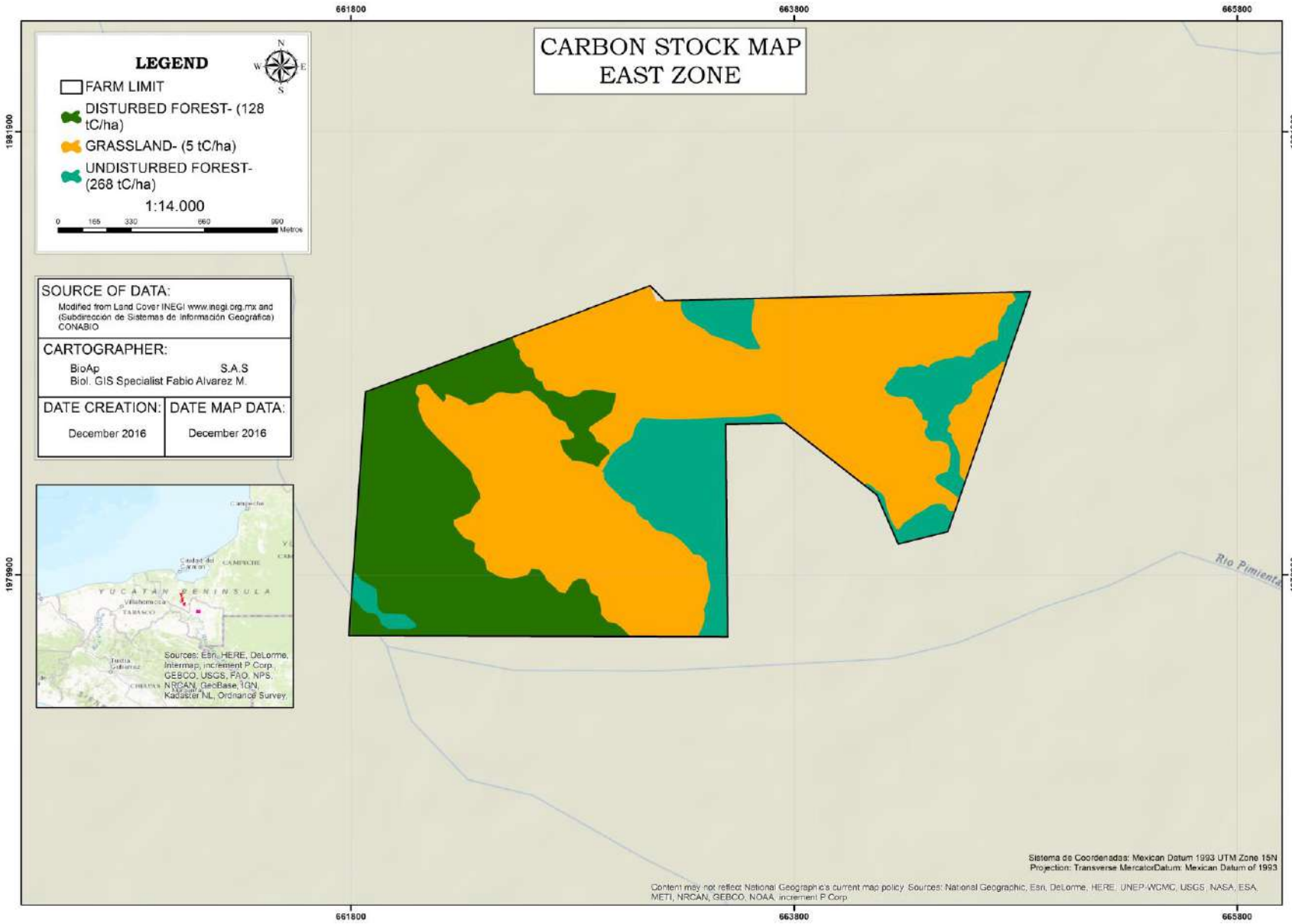


Figure 60. Zoning of carbon stock areas by vegetation coverage in the Eastern Area.

3.5.1.2 Overlapping of Areas of High Conservation Value (AHCV) and fixing carbon vegetation

Overlapping the AHCVs and areas with high values of carbon stored, the main vegetation coverage types and areas ecologically sustainable for flora and fauna were identified. To obtain such results, the identification of AHCVs and carbon fixing criteria were crisscrossed. Figure 61 shows the AHCV areas and the conservation priority areas in orange color.

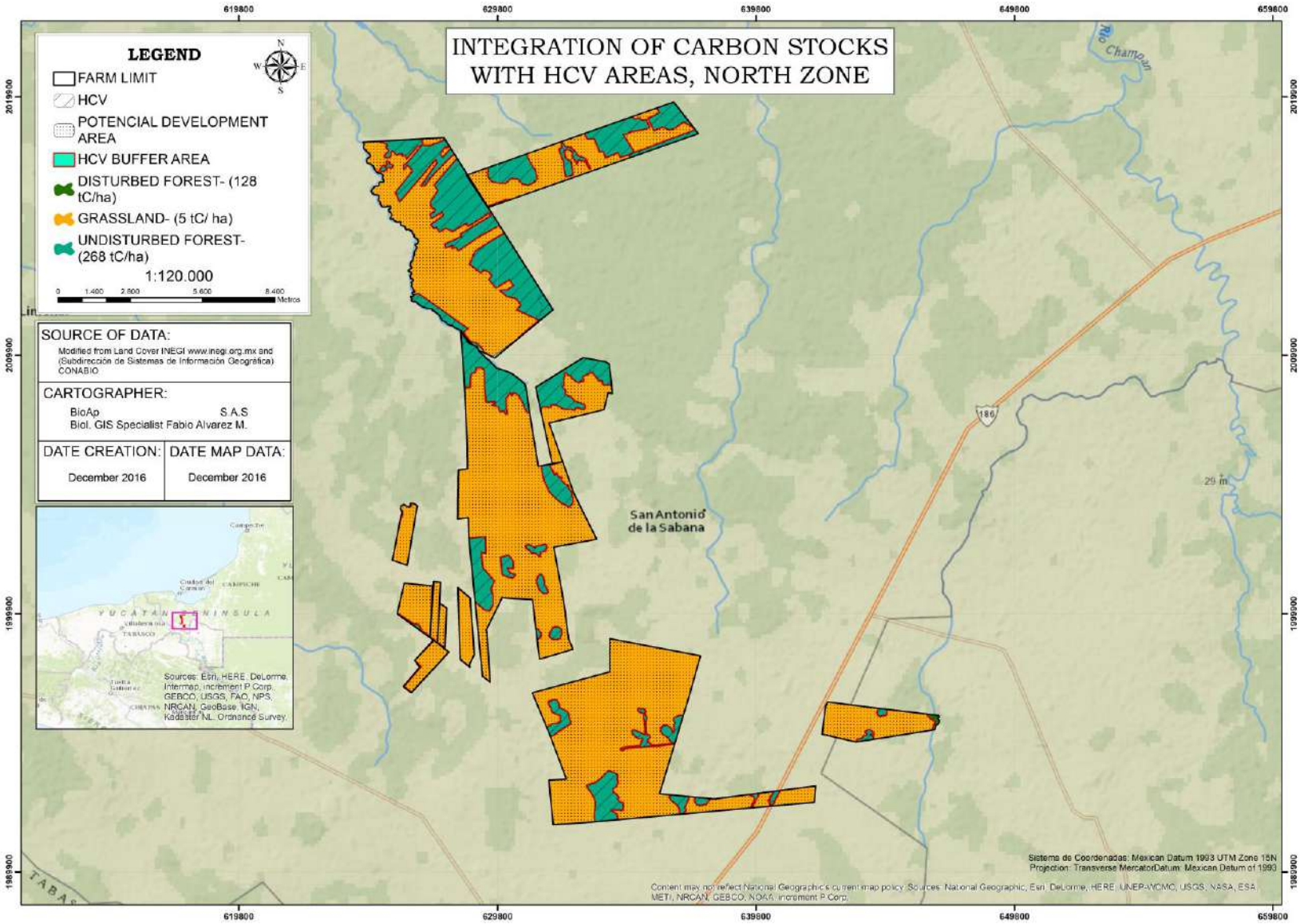


Figure 61.AHCV and carbon stock areas in the Northern Area.

In the Western area, hydrophilic forest and evergreen forest were identified as AHCV areas due to the high importance of such ecosystems as energy flux regulators of the biodiversity in the region as shown in Figure 62.

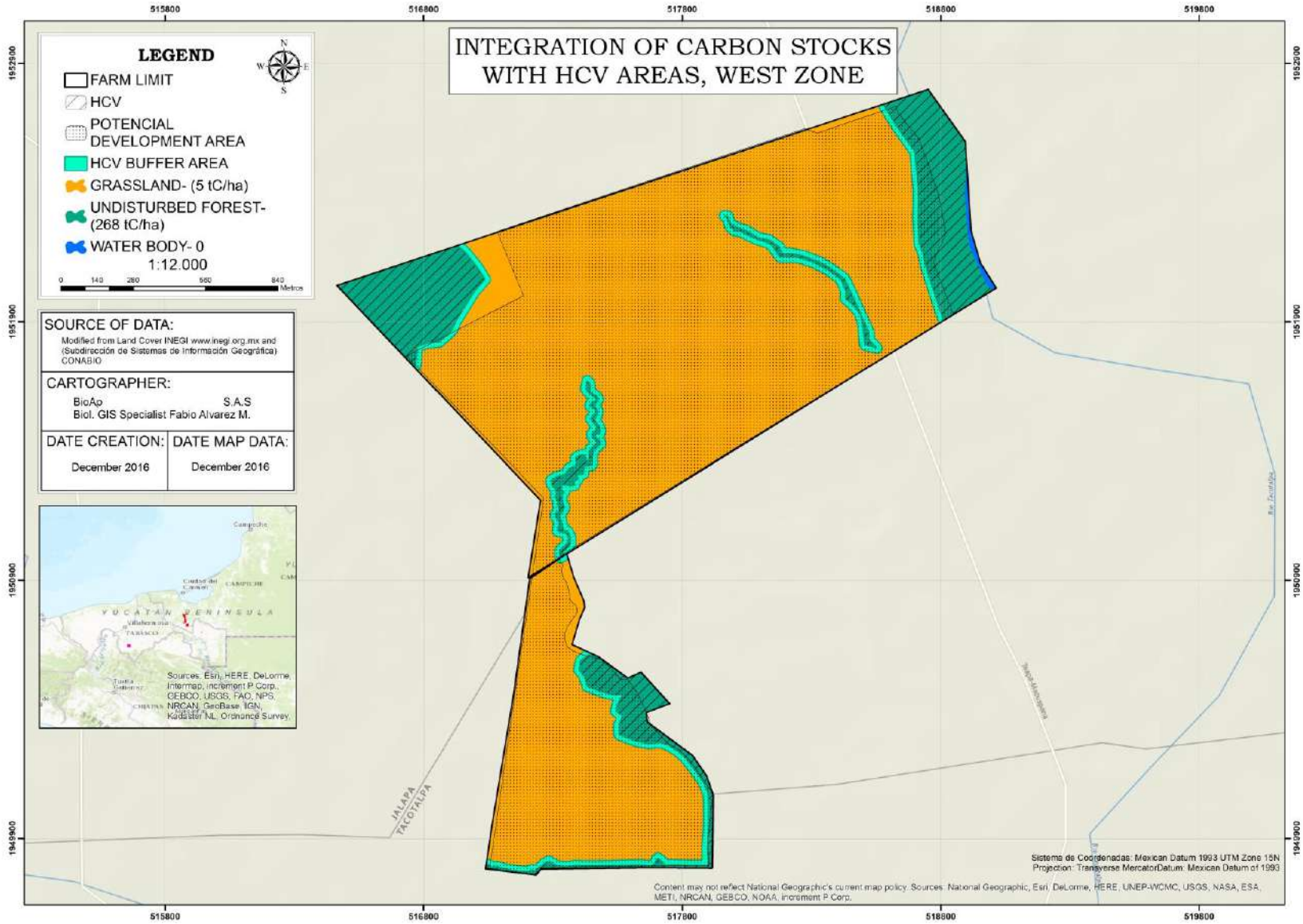


Figure 62.AHCV and carbon stock areas in the Western Area.

In the Eastern zone, hydrophilic forest, oak forest, and evergreen forest showed the highest values of carbon fixing, and they are considered as AHCV due to their ecosystem importance as energy flux regulator of biodiversity in the region as shown in Figure 63.

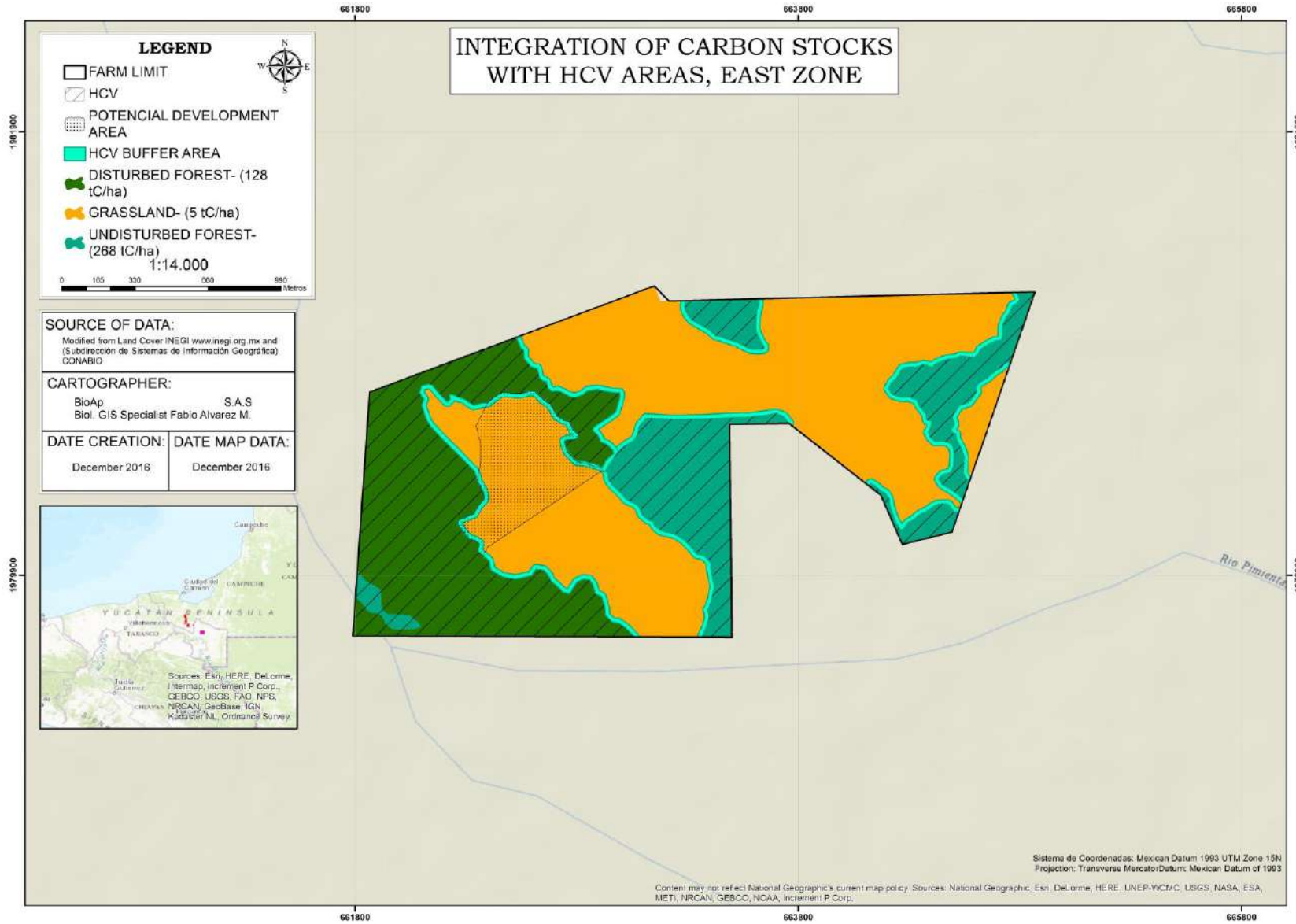


Figure 63.AHCV and carbon stock areas in the Eastern Area.

3.5.2 Results form GHG Calculations

3.5.2.1 Scenario selection

According with the information above, Table 27 shows the possible scenarios for new developments.

Table 27. Scenarios for new plantings development

		Scenario 1	Scenario 2
Area avoided for any development	HCV area	1851,53	1851,53
Potential areas for new plantings	Disturbed forest	0	93,25
	Tree Crop	0	0
	Shrub land	0	0
	Annual/food crop	0	0
	Grassland	10355,16	10355,16
POME Treatment	Conventional Treatment	Y	Y
	Methane capture	-	-

The scenario selected by Palmicultores San Nicolas is Scenario 1 where the grasslands are the potential areas to clear for oil palm, no methane capture facilities are planned for mill, and no HCV areas will be cleared.

3.5.2.2 Stage 1

The results obtained by the emissions calculator developed by RSPO to quantify the tons of CO_2 emitted from the new plantations, found that in this study area a total of 50,870 tons/year are produced and the new plantation areas unsetting activities emits a total of 20,380 tons/year as shown in Figure 64.

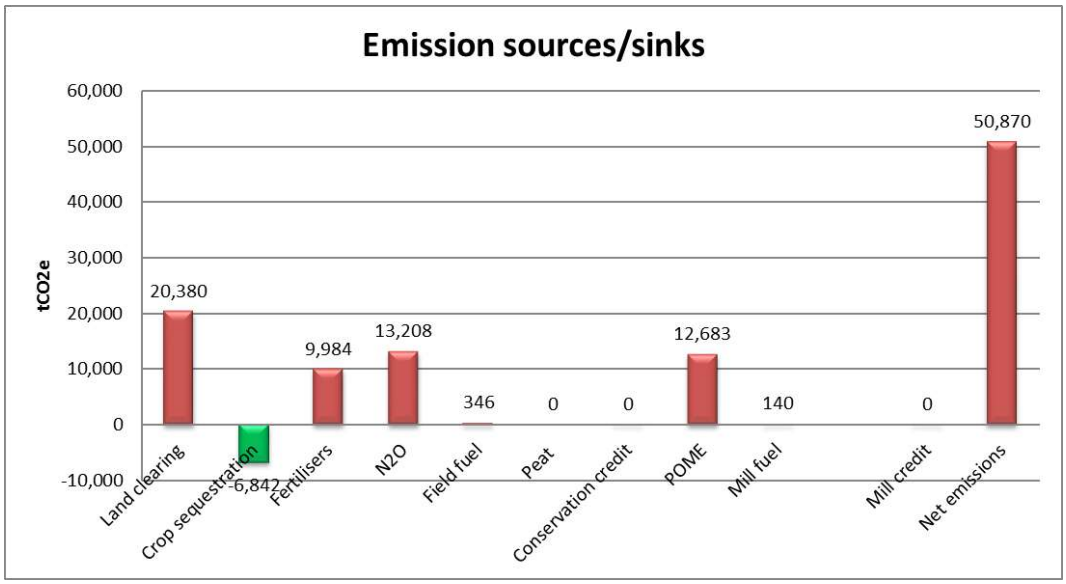


Figure 64 Emission results from new plantation activity.

Source: BioAp; 2016.

Calculations of CO_2 emissions was done at the extraction plant by calculating the release of GHG where was concluded that the activity that causes the most damaging effects for the environment is the production of POME, which is emitting a total of 12,683 tons/year corresponding to 91,9% of the total emissions at the extraction plant as shown in Figure 65.

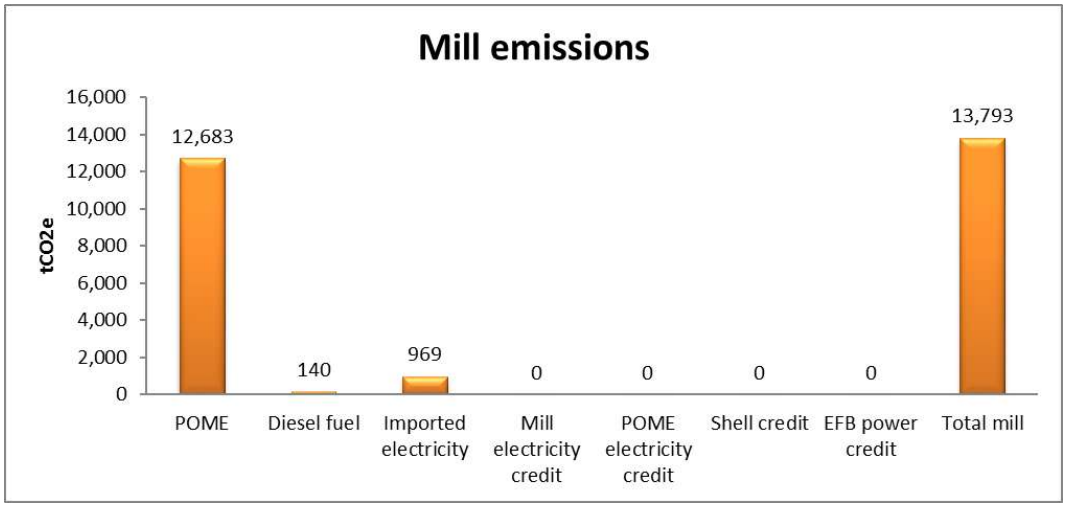


Figure 65 Emission results from Palenque extraction plant stage 1.
Source: BioAp; 2016.

The results of CO_2 emissions for the pre-sowing and sowing stages are shown in Figure 66. The results suggest that in the present study, the activity producing the highest CO_2 emissions are the unsetting of sowing areas.

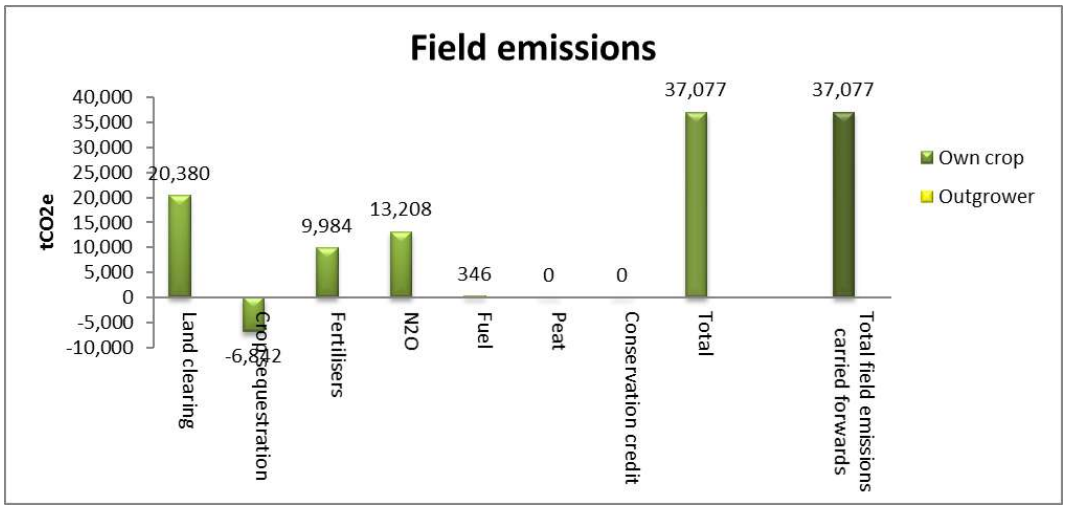


Figure 66 Emission results from San Nicolás Plantation.
Source: BioAp; 2016.

1.1.1 Stage 2

Unlike Scenario 1 the Scenario 2 has included in addition to Grasslands (1019 ha) Disturbed forest areas (93,25 ha) for new plantings. This means that carbon emissions will increase in 346 t CO2e (Figure 67).

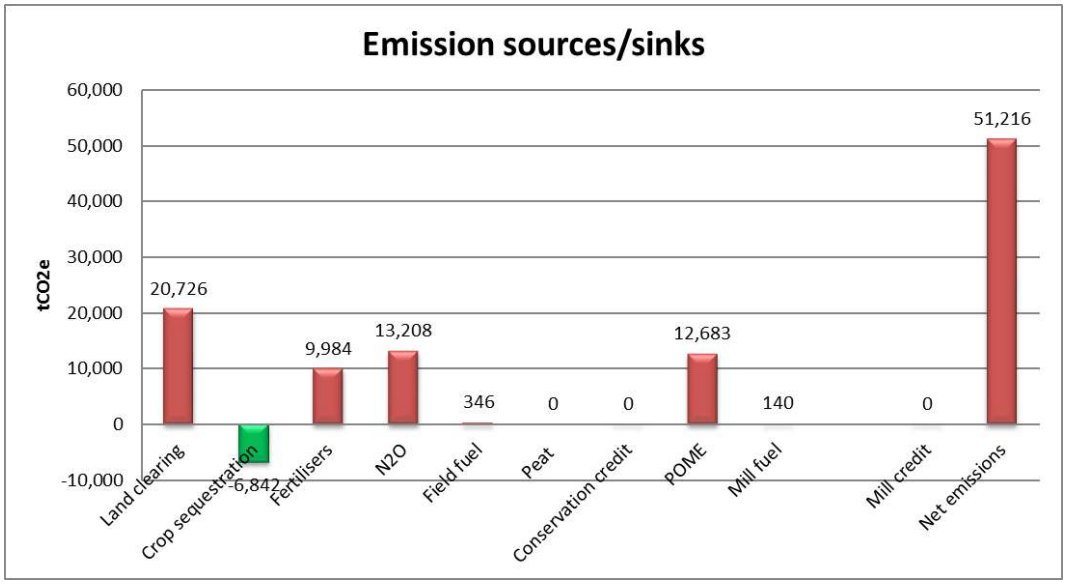


Figure 67 Emission results from new plantation activity stage 2.
Source: BioAp; 2016.

When comparing both scenarios there is a increase of 0.99% in carbon emissions, resulting in Scenario 1 as the best option. Altough is not very significant is generated an emission decrease as shown in Figure 68.

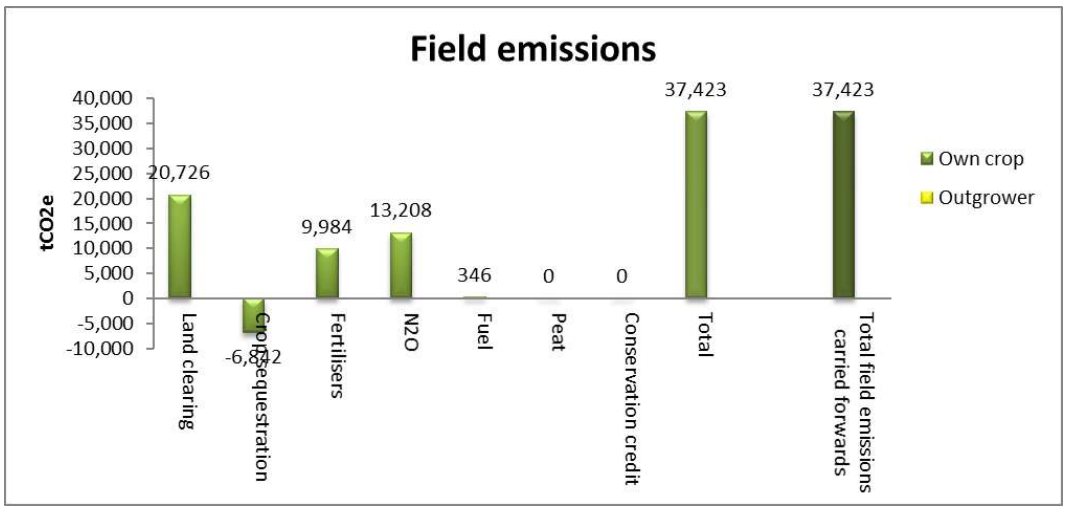


Figure 68 Emission results from Palenque extraction plant stage 2.
Source: BioAp; 2016.

4 SUMMARY OF MANAGEMENT PLANS

4.1 Team responsible for developing management plans

The team responsible for developing management plans, planning and implementation are:

- Gabriel Ricardo Bedoya Moreno, Plantations Manager
- Duperly González Rodríguez, Sustainability Manager

- Eddie Cab Cab, Team member (Ambiental engineer)
- Manuel Dodero Estudillo, Team member (Plantations)
- Matilde Alvarado Irineo, Team member (Documentary system)
- In selection process, Team member (Biologist)
- In selection process, Team member (Corporate social responsibility)

4.2 Summary

Following Table 28 shows the Summary of Management Plans for Palmicultores San Nicolás.

Aditionally, in order to avoid vegetation cover degradation, Palmicultores San Nicolás has selected some sowing areas for conservation and plant enrichment around the new and existing planting areas (Figure 69, Figure 70, and Figure 71).

Table 28 Summary of Management Plans for Palmicultores San Nicolás

*Type of Action: CTRL= control, PVEN=prevention, MTIN= mitigation, CPEN=compensation

No	Management Program	Impacts/Threatens	Objective / Management & Mitigation Plan	*Type of Action	Timing	Person in charge	SEIA/ HCV
1	Forming an environmental management group	NA	To establish a group that gurantee compliance and effective development of proposed actions	CTRL - PVEN	Ongoing,	Planting Manager, Sustainability Manager	Yes/ No
2	Environmental training for planting personnel	1. Breach of regulations due to ignorance. 2. Failure procedures. 3. Integrated management inadequate.	To train personnel involved in technical issues, environmental management, occupational safety and health, and social responsability	CTRL - PVEN-MTIN	Ongoing	Planting Manager, Head of environmental and OH&S issues	Yes/ No
3	Soil management Program	1. Changes in soil quality	To minimize impacts caused on the soil by stripping and sowing.	CTRL - PVEN-MTIN	After Land Clearing	Head of environmental and OH&S issues	Yes/ No
4	Surface and Underground Water Management Program	1. Changes in noise levels. 2. Changes in soil quality 1. Changes in surface water quality. 2. Alteration of the riverbed. 3. Alteration of phreatic level	To establish drainage system following topographic parameters	CTRL - PVEN-MTIN	Ongoing	Environmental and OH&S Professionals	Yes/ No
5	Solid waste Management and Disposal	1. Changes in soil quality. 2. Changes in surface water quality. 3. Changes in quality air. 4. Impact on water bodies	To reduce and mitigate impacts caused by waste generation	CTRL - PVEN-MTIN	Ongoing	Head of environmental and OH&S issues	Yes/ No
6	Gas and chemical substances Management	1. Changes in soil quality. 2. Changes in surface water quality. 3. Alteration of current land use	To implement best practices tin order to control gas and chemical substances	CTRL - PVEN	Ongoing	Head of environmental and OH&S issues	Yes/ No

No	Management Program	Impacts/Threatens	Objective / Management & Mitigation Plan	*Type of Action	Timing	Person in charge	SEIA/ HCV
	and Disposal		management during operating conditions / Implementation of organic Fertilizers				
7	Transport and Vehicle control and inspection Program (particulate matter and fresh fruit loss)	1. Changes in noise levels. 2. Changes in air quality. 3. Changes in surface water quality	To reduce the amount of dust in the air and gases emission / Harvesting by animal traction (Buffaloes)	CTRL - PVEN	Ongoing	Head of environmental and OH&S issues	Yes/ No
8	Stripping and Vegetation Cover Management	1. Loss of vegetation cover. 2. Landscape impact. 3. Impact on endemic, threatened, and ecological/economic/cultural significance species.	To avoid vegetation cover degradation/ Plan for Conservation and Forest enrichment	CTRL - PVEN-MTIN	After Land Clearing	Environmental and OH&S Professionals	Yes/ Yes
9	Recovery of affected areas	1. Loss of vegetation cover. 2. Landscape impact	To recover vegetation cover, protect banks, and eavoid erosive process. Restoration / Plan for Conservation and Forest enrichment	CTRL - PVEN-MTIN	Progressi ve	Head of environmental and OH&S issues	Yes/ Yes
10	Forestry land use Management Program	1. Loss of vegetation cover. 2. Landscape impact. 3. Habitat fragmentation and loss of biological corridors. 4. Landscape impact	To optimize wood and plant material use (in the Influenced Area).	CTRL - PVEN	Progressi ve	Environmental and OH&S Professionals	Yes/ No
11	Fauna and Flora Protection	1. Fauna loss. 2. Habitat fragmentation and loss of biological corridors. 3. Impact on endemic, threatened, and ecological/economic/cultural	To define proper actions for sowing management. Vegetation management. Ensure	CTRL - PVEN-MTIN	Before Land clearing,	Head of environmental and OH&S issues	Yes/ Yes

No	Management Program	Impacts/Threatens	Objective / Management & Mitigation Plan	*Type of Action	Timing	Person in charge	SEIA/ HCV
		significance species.	links between flora and fauna.				
12	Sensitive Ecosystems Protection	1. Loss of vegetation cover. 2. Landscape impact. 3. Habitat fragmentation and loss of biological corridors.	To keep and ecological equilibrium throught forest ecosystems compensation	CPEN	Progressive,	Environmental and OH&S Professionals	Yes/ Yes
13	Water resource Management Program	1. Impact on water bodies. 2. Fauna loss	To protect and preserve wáter sources	CTRL - PVEN	Progressive,	Head of environmental and OH&S issues	Yes/ Yes
14	Communication Management, Information and Involvement with communities	1. Existing infrastructure affectation and utility network. 2. Generating expectations	To promote comunicartion, and socialized .	CTRL - PVEN-MTIN	Ongoing	Planting Manager; Head of RH, Head of RSE	Yes/ No
15	Traffic Management Plan	1. Generation of accident hazards. 2. Mobility changes	To avopid damage on the infrastructure , and identify high accidentally zones	CTRL - PVEN-MTIN	Ongoing	Planting Manages; Head of SGD plantations	Yes/ No
16	Linking labor	1. Supply of and demand for labour. 2. Generating expectations	To link unskilled labor of resident personnel within the direct area of influence of the project.	CTRL - PVEN-MTIN	Ongoing	Project Manager / RH	Yes/ No
17	Establishment of alliances with educational institutions	1. Supply of and demand for labour. 2. Mobility changes. 3. Generation of accident hazards	To establish alliances with institutions of higher education in the region for the development of joint actions.	CTRL - PVEN-MTIN	Ongoing	Head of Human resources and Head of RSE	Yes/ No

No	Management Program	Impacts/Threatens	Objective / Management & Mitigation Plan	*Type of Action	Timing	Person in charge	SEIA/ HCV
18	Revegetation and Reforestation Program	1. Loss of vegetation cover by agricultural activities	To coordinate revegetation and reforestations programs withing the direct area	CTRL - PVEN-MTIN-CPEN	Progressive	Planting Manager, Head of Environmental issues	Yes/ Yes

Measures taken to maintain and increase carbon stocks within the areas of new plantations are hilighted in soft grey, and the others correspond to management programs propsed to SEIA and HCV studies.

Figure 69Sowing area in North Zone

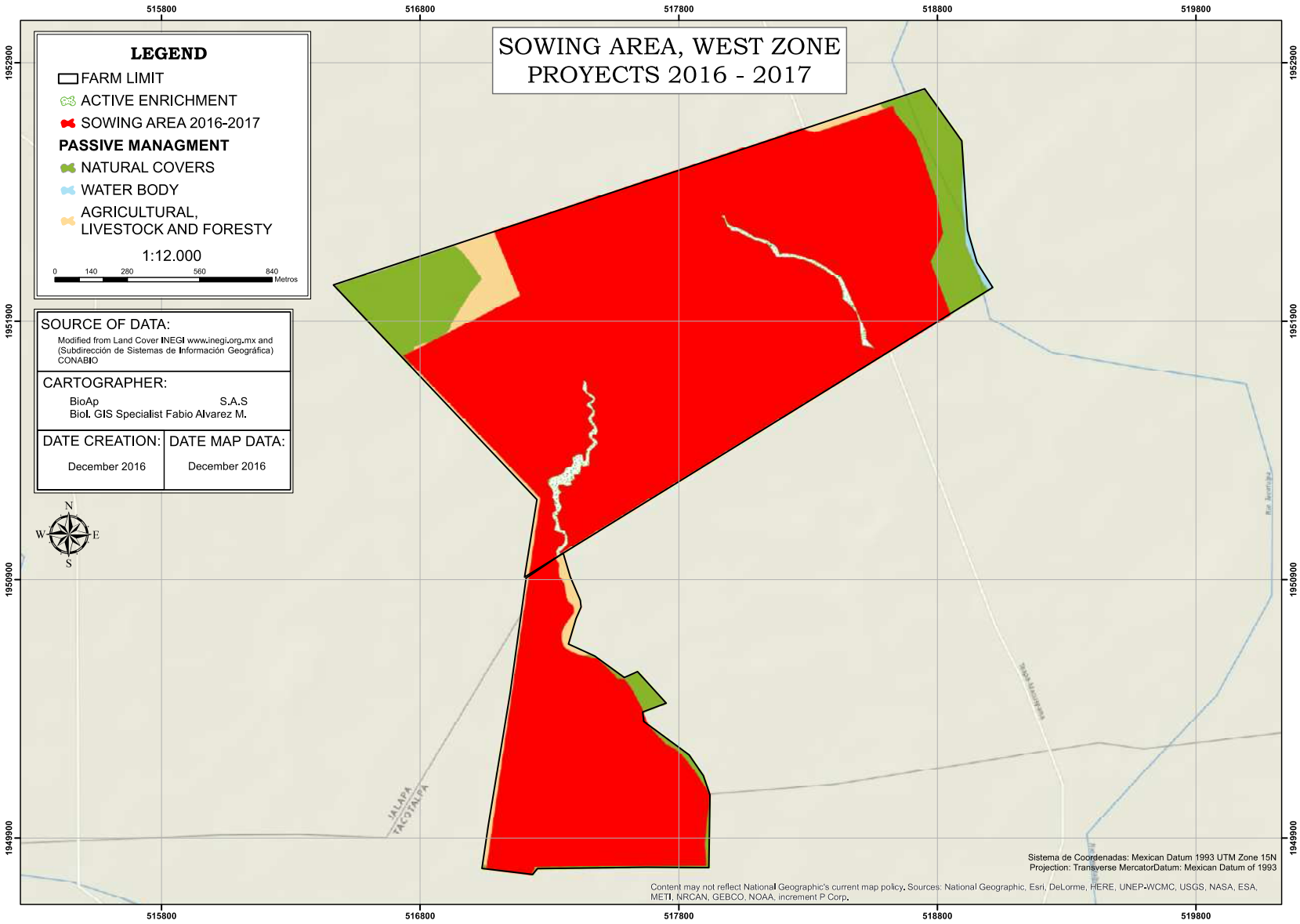


Figure 70Sowing area in West Zone

Figure 71Sowing area in East Zone

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6 INTERNAL RESPONSABILITY

OLEOPALMA

Villahermosa, Tabasco, México
17 de agosto de 2016

RSPO

To whom it may concern

The objective of this letter is to express that the General management of Oleopalma's Group (Agroindustrias de Mapastepec, S.A. de C.V. Agroindustrias de Palenque, S.A. de C.V. and Palmicultores San Nicolás S.P.R. de R.L.) manifests its agreement with the results from all the studies that have been done to fulfill the requirements of the new plantations procedure of RSPO (EISA, HCV, LUCCA, GHG and soil suitability) and that the general management is completely committed to monitor and execute the proposed action plan, by supplying financial and human resources to fulfill it.

José Luis Pérez Morett
Oleopalma CEO

Therefore, Oleopalma has a group of specialized technicians in each topic:

Duperly González Rodríguez
Sustainability Manager

Eddie Cab Cab
Environmental Engineer

Gabriel R. Bedoya Moreno
Plantations Manager

Juan Pablo Zorro Cerón
BioAb

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