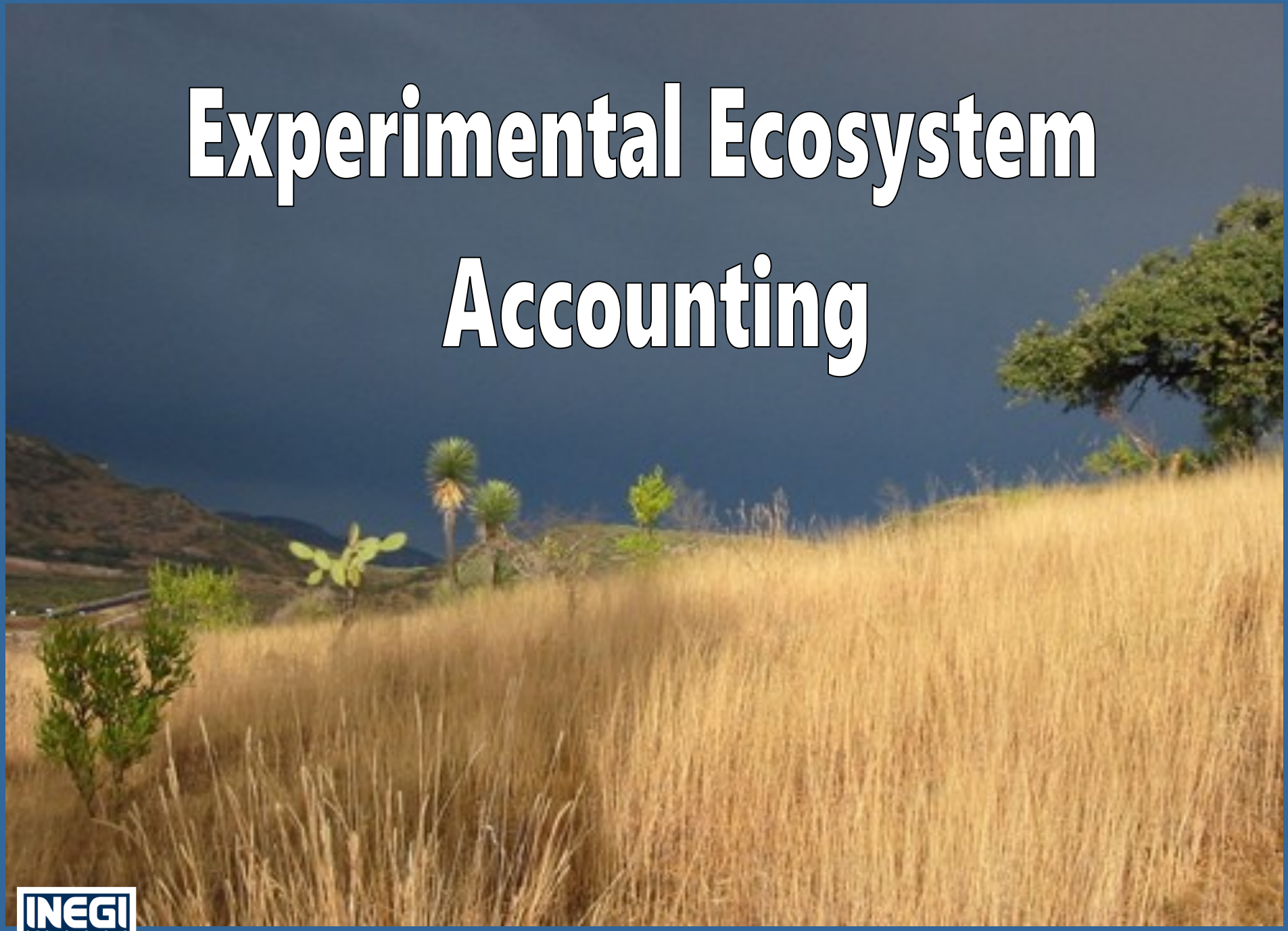
Experimental Ecosystem Accounting



INEGI
INSTITUTO NACIONAL
DE ESTADÍSTICA Y GEOGRAFÍA

Aguascalientes - Mexico

Source: http://arribaelcampo.com.mx/sitio/?p=9264

Experimental Ecosystem Accounting. Aguascalientes Study Case, Mexico. 2016. Participating Institutions: National Institute of Statistics, Geography and Informatics (INEGI), Ministry of Environmental and Natural Resources (SEMARNAT), National Commission for Protected Areas (CONANP), National Commission for the Knowledge and Use of Biodiversity (CONABIO), National Forestry Commission (CONAFOR), National Water Commission (CONAGUA), National Institute of Ecology and Climate Change (INECC), German International Cooperation (GIZ) y Biodiversity Finance Initiative (BIOFIN).

Source: http://vivaaguascalientes.com/cerro-del-muerto/

CONTENTS

1. INTRODUCTION

Source: http://vivaaguascalientes.com/parque-ecologico-el-sabinal/

1. INTRODUCTION

At invitation of United Nations Statistics Division (UNSD) and United Nations Environment Programme (UNEP), Mexico participates as pilot country beside Butan, Chile, Indonesia, Vietnam, South Africa and Mauricio in implementation of the System of Environmental-Economic Accounting and Experimental Ecosystem Accounting (SEEA-EEA).

As part of the implementation process of the Experimental Ecosystem Accounting in Mexico, UNSD beside INEGI developed the National Plan for the Advancement of Environmental and Economic Accounting 2015 (PN-ACAE, for it spanish acronym). In this one were linked already existing initiatives of the Environmental Accounting in Mexico with the SEEA.

Source: http://www.aguascalientes.gob.mx/estado/resena.aspx

Source: http://bdi.conabio.gob.mx/fotoweb/Grid.fwx

In the National Plan were identified as priorities for the development of the ecosystem accounting the next accounts:

- Water pilot accounts.
- Land cover pilot accounts.
- Biodiversity pilot accounts.
- Study cases.
- Assessment of viability of accounting for Carbon, ecosystem condition, as well as supply and use

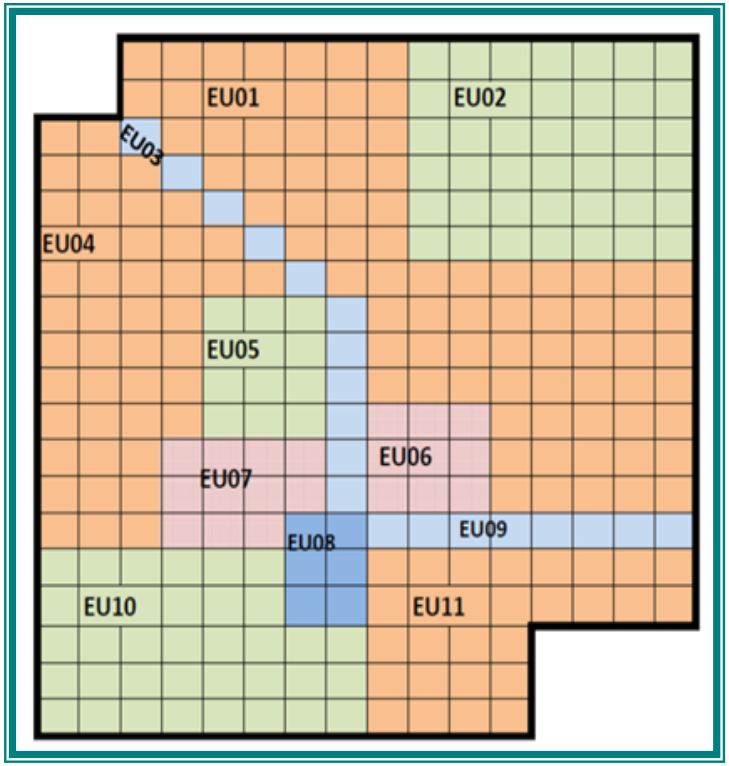
In Mexico were used as inputs polygons in vectorial format, it allows performing calculations directly and get more precise results.

Construction process of environmental accounting begins registering the variables in physics units and ends with its monetary valuation. To do registering of physical information is necessary to use spatial geographic information, from it is possible to extract statistics data which is going to be useful for generate tables that are part from the ecosystem accounting.

In agreement with SEEA-EEA exist three basic spacial areas in the demarcation of ecosystems, each one of these works as an analysis unit. The first one is the Ecosystem Accounting Unit (EAU), which serves as a basic delimitation of an environment at macro level (for example a municipality). The next spatial analysis unit is Land Cover Ecosystem Unit (LCEU), which refers to especially cover and land use sortings (set of grids of the same color in Figure 1). At last, the most elemental unit is called Basic Spatial Unit (BSU), and it is the result of the división of total analyisis area in grids. This is by data in raster format.

Actually, use grids was replaced by polygons in vectorial format, which allows performing calculations directly and get more precise results than using raster data. That is the reason because of Mexico opted for the use of vectorial data.

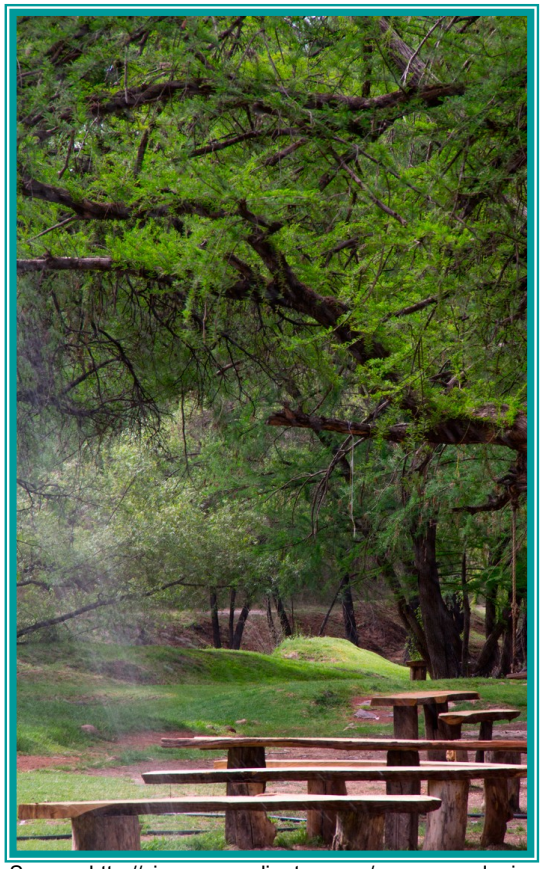
Figure 1. Analysis units.



The first of all accounts that it is constructed is Ecosystem Extent Account, which underpins the production of each one of the subsequent accounts. Furthermore, without this one it is impossible the measurement of flows services and the later economic valuation. The Extent Account consists on tables of LCEU extent for each EAU, balance tables of changes of land and vegetation cover and the matrix of changes in land and vegetation cover.

Secondly, it is generated condition account, in this one is recordered the condition of the different ecosystem components, such as land, carbon, water and biodiversity. On the other hand, these accounts integrate the tables of tematics accounts identified as priority in the National Plan. For the register of land condition there are tables with types of soil and erosion tables. The vegetation successional phases (condition) are collected in tables of vegetation condition. In the matter of water, there are included tables of superficial and underground water quality. Biodiversity accounts integrate tables of species wealth, tables of species abundance and genetic diversity tables.

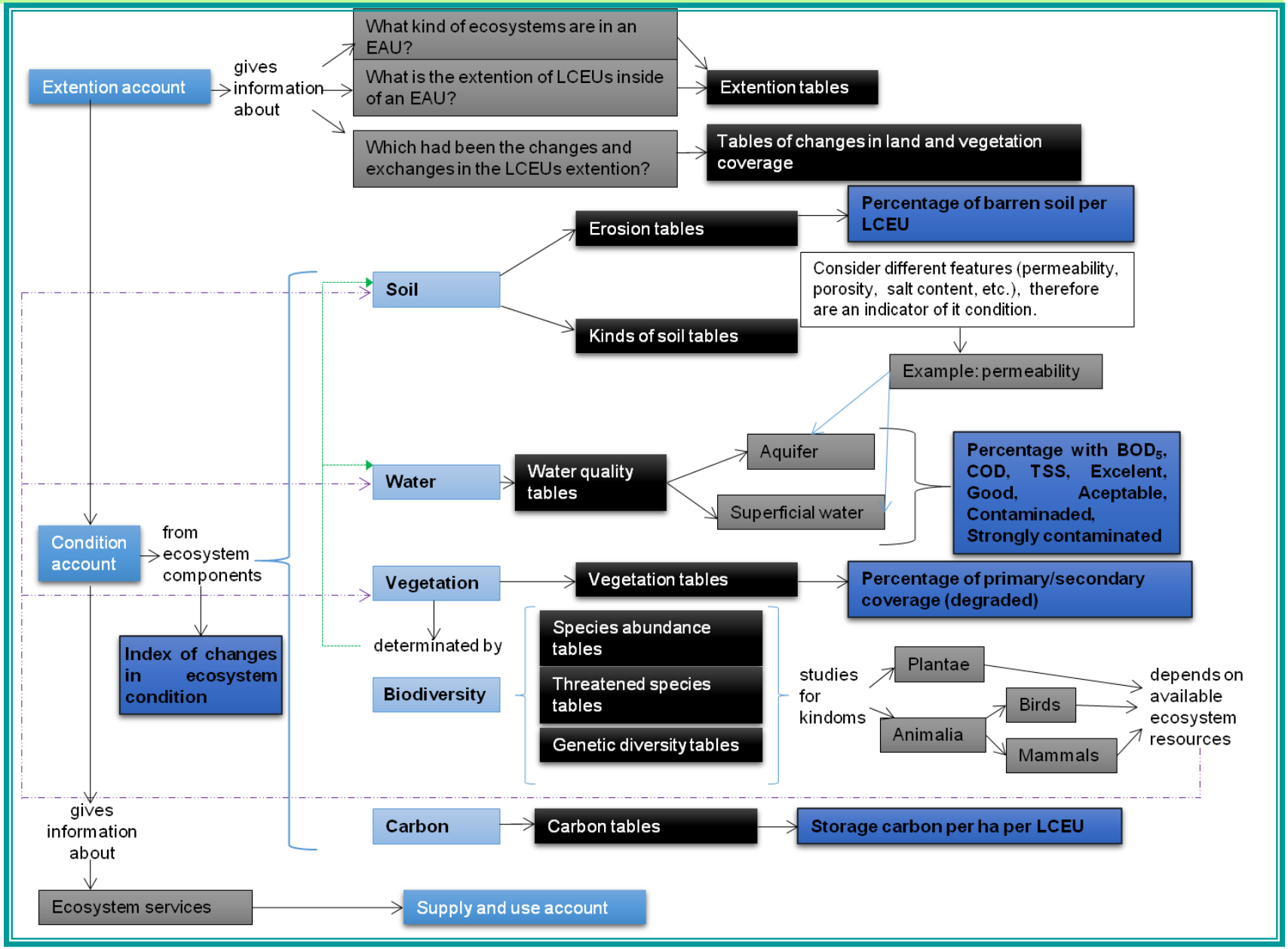
This distinction between components remains on the third account, supply and use of services tables (provisioning, regulation and cultural) of ecosystems in physical and monetary units. For these are performed valuation exercises through many methods, it depends on the type of services studied.



Source: http://vivaaguascalientes.com/parque-ecologico-el-sabinal/

The next figure shows the interrelation between accounts and ecosystem components in each one.

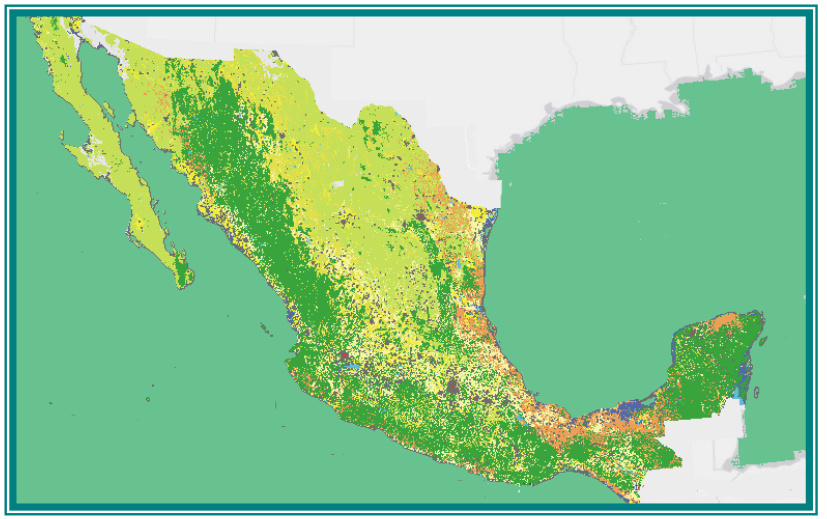
Figure 2. Diagram of Experimental Ecosystem Accounting in Mexico.



1.1 General overview of Mexico and State of Aguascalientes

Mexico has a territorial extension of 1,959,247.98 km^2 [1], with such a big diversity of ecosystems and species that put it on the 13th place of the World[2], its diversity is the fourth more extensive in the World; in flora and fauna way Mexico is important too, due to at global level this country has the second place in reptiles diversity, the third in mammals diversity, the fifth place in amphibians and vascular plants, and finally, the 11th in birds variety[3]. Physiographic features as geology, topography, coastal and weather advantages a great variety of types of ecosystems on the country, such as shrubland (528,776.39 km^2), agriculture land (310,178.89 km^2), pastures (274,269.49 km^2), forest (222,294.11 km^2), jungle (122,244.97 km^2), water bodies (25,769.47 km^2), urban areas (22,940.50 km^2), and areas without vegetation (9,306.86 km^2)[4]. All of that turns Mexico into one of the twelve magadiverse conuntries in the World, it refers to those countries which have almost 70% of all biodiversity in the World.

Source: http://bdi.conabio.gob.mx/fotoweb/Grid.fwx



[1] INEGI (2005). *México en cifras*.

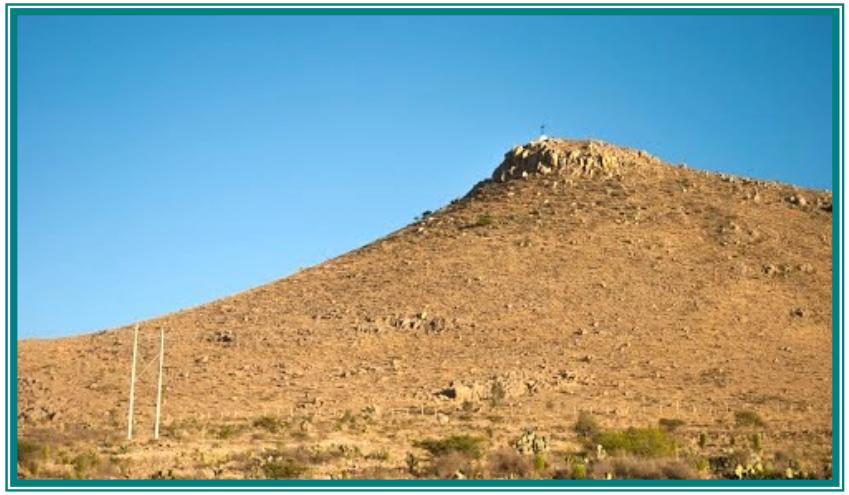
[2] INEGI (2015). *Anuario estadístico y geográfico de los Estados Unidos Mexicanos 2015*.

[3] CONABIO (2009). *Capital Natural de México. Síntesis. Conocimiento actual, evaluación y perspectivas de sustentabilidad*.

[4] INEGI (2005). *México en cifras*.

This text shows a first approach in the Mexican Ecosystem Accounting construction, through develope of a study case about Aguascalientes state. The methodology used for it is being employed it for the rest of the 31 mexican states too.

The selection of this state to do the first test underpins in the accessibility and management of the information. Aguascalientes has a big quantity of information about all topics required for Ecosystem Accounting. Furthermore, its extent and administrative division are suitable to show in detail the develope of Mexican Experimental Accounting. Some of criteria used in the selection of Aguascalientes as the first state are showed in the next table.



Source: Mapas Carreteras de México, *Asientos.*

Source: https://www.mexicodesconocido.com.mx/feria-san-marcos-aguascalientes.html

Table 1. Criteria of selection of Aguascalientes.

Criteria of selection of Aguascalientes.	
Municipalities	11
Biological diversitiy	988 species of flora and 609 species of fauna [5]
Ecosystemic diversity	4 grups of main vegetation: shrubland, forests (pine and encino), pastures, low caducifolia jungle.

[5] SEMARNAT (2015). *Compendio de Estadísticas Ambientales 2014.*

2. ECOSYSTEM EXTENT ACCOUNT

Source: http://vivaaguascalientes.com/cerro-del-muerto/

2. ECOSYSTEM EXTENT ACCOUNT

This document shows for every account a municipality as an example , in addition to statal information.

2.1 Extent tables 2002-2011

LCEU extent measurements for each EAU, are recordered in the extensión tables for 2002 and 2011 years, which are the years studied in this document.

For every account there is a municipality as example, in addition, there is statal information too[6].

In the case of Aguascalientes state there were developed 11 tables, each one belongs to each municipality in the state.

In the next table there is the information about municipality Jesus María extent account, which has seven LCEU.

Table 2. Municipal extent table. 2002 and 2011.

LCEU extent for Jesus Maria municipality. EAU / SEEA classification	Aguascalientes (2002)	Aguascalientes (2011)
Urban and associated developed areas	3.87	16.29
Middle to big fields, rainfed herbaceous crops	57.59	63.25
Middle to big fields, irrigated herbaceous crops	107.26	101.61
Permanent crops, agricultural plantation	NA	NA
Associations and agricultural mosaics	NA	NA
Pastures and natural grasslands	171.71	164.58
Forest tree cover	150.88	146.13
Shrubland, bushland, heathland	10.06	9.12
Sparsely vegetated areas	NA	NA
Mosaics and natural vegetation associations	NA	NA
Barren land	NA	NA
Permanent snow and glaciers	NA	NA
Open wetlands	NA	NA
Continental water bodies	3.62	4.01
Coastal water bodies	NA	NA
Sea	NA	NA
Total	***504.99***	***504.99***

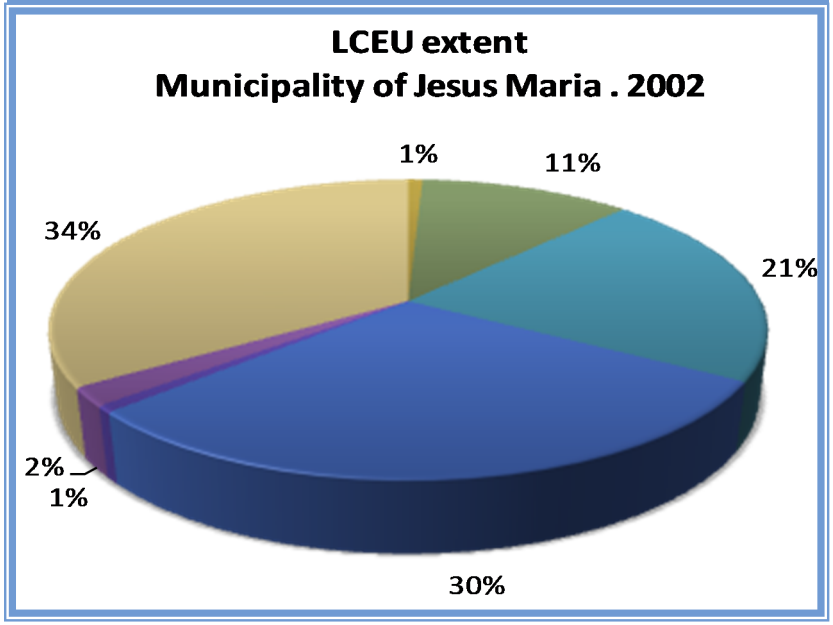
[6] On the methodological document is shown information for all Aguascaliente's municipalities.

Land cover has changed by the time, but this changes are reduced in percent terms. Just over a third of the municipality is covered by grasslands, another third percent is represented by forest tree cover. Around a fifth part of the municipality is coveraged by irrigated herbaceous crops, while, temporary agriculture coverage is between of 11% and 12% of Jesus María's territory. In addition, urban areas were less than 1% in 2002, but incresed more than 3% in 2011. The next graphics show LCEU percentage distribution in Jesus María for 2002 and 2011 years. These are followed for maps that represent land cover in the municipality.

Symbology

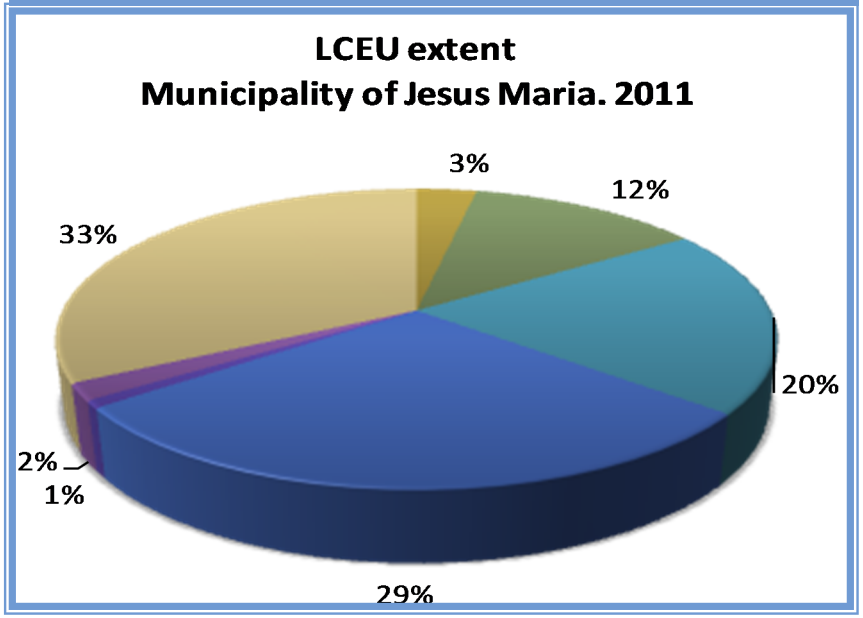
- Urban and associated developed areas
- Middle to big fields, rainfed herbaceous crops
- Middle to big fields, irrigated herbaceous crops
- Forest tree cover
- Continental water bodies
- Shrubland, bushland, heathland
- Pastures and natural grasslands

Graphic 1. Municipal LCEU extent. 2002.



INEGI (2012). Use and land cover *Serie III, scale 1:250,000.*

Graphic 2. Municipal LCEU extent. 2011



INEGI (2012). Use and land cover *Serie V, scale 1:250,000.*

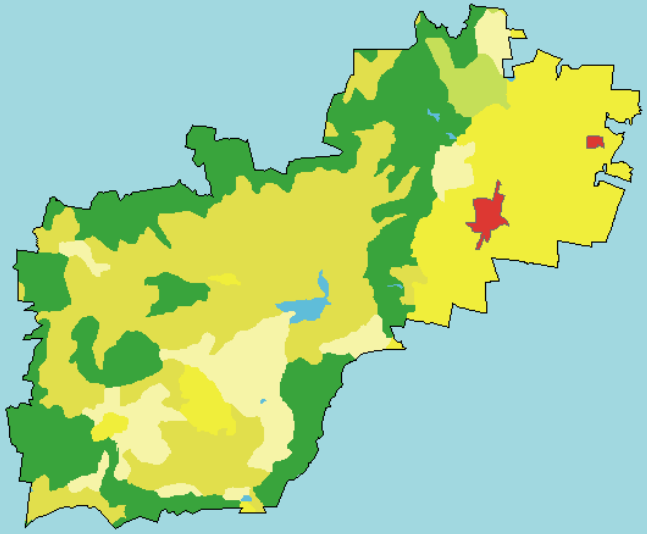
Figure 3. Municipal maps of land and vegetation cover . Analysis units.

Municipality of Jesus María

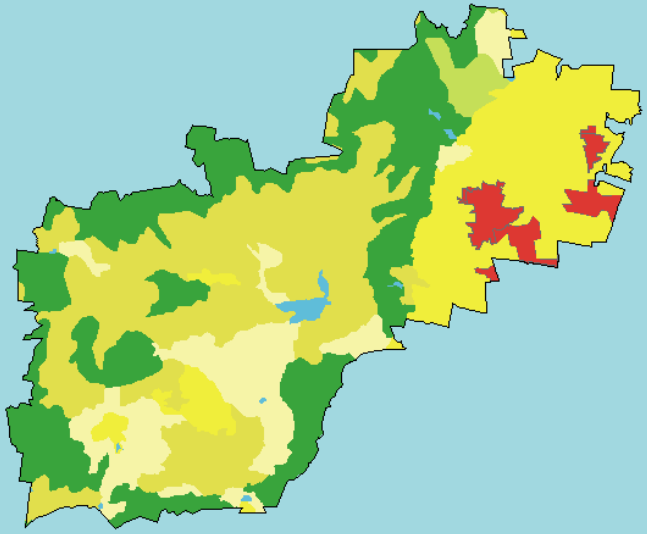
DATA SHEET

Map of use and land cover in accordance with INEGI's classification, Serie III (2002– 2005) and Serie V (2011-2013).
Scale: 1:250,000
Proyection: Albers Equal Area (datum ITRF92)
Municipality: Jesus Maria
State: Aguascalientes.
Basic Spatial Unit (BSU): agriculture and induced pastures (25ha); vegetatives communities (50 ha); water bodies, islands, coastals, etc., consideraded with another criteria.

(2002)



(2011)



- Urban and associated developed areas
- Middle to big fields, rainfed herbaceous crops
- Middle to big fields, irrigated herbaceous crops
- Permanent crops, agricultural plantation
- Pastures and natural grasslands
- Forest tree cover
- Shrubland, bushland, heathland
- Continental water bodies

In the same way, it is possible to do the previous analysis at state level, we only have to add all municipalities information from the state. So, the state is going to be considered as EAU.

In the same way, it is possible to do the previous analysis at state level, we only have to add all municipalities information from the state. So, the state is going to be considered as EAU.

Total Aguascalientes territory is about 5,615.67 km^2, in which all joined crops predominate. But, in other hand, the proponderant natural ecosystem are pastures.

In the next table there is the balance between records of 2002 and 2011. This information is completed with the graphics on the next page.

Table 3. Table of LCEU state extent for the years of 2002 y 2011.

LCEU extent for Aguascalientes state (Km^2)		
SEEA classification	**2002**	**2011**
Urban and associated developed areas	111.52	175.14
Crops	**2,407.69**	**2,477.05**
Middle to big fields, rainfed herbaceous crops	1,179.90	1,219.55
Middle to big fields, irrigated herbaceous crops	1,226.79	1,256.51
Permanent crops, agricultural plantation	0.99	0.99
Associations and agricultural mosaics	NA	NA
Pastures and natural grasslands	1,405.01	1,321.40
Forest tree cover	1,254.41	1,221.33
Shrubland, bushland, heathland	393.36	373.73
Sparsely vegetated areas	NA	NA
Mosaics and natural vegetation associations	NA	NA
Barren land	NA	0.62
Permanent snow and glaciers	NA	NA
Open wetlands	NA	NA
Continental water bodies	43.68	46.40
Coastal water bodies	NA	NA
Sea	NA	NA
Total	***5,615.67***	***5,615.67***
Previous measurement of area	5,615.67	5,615.67
Total margen of error	0.00	0.00

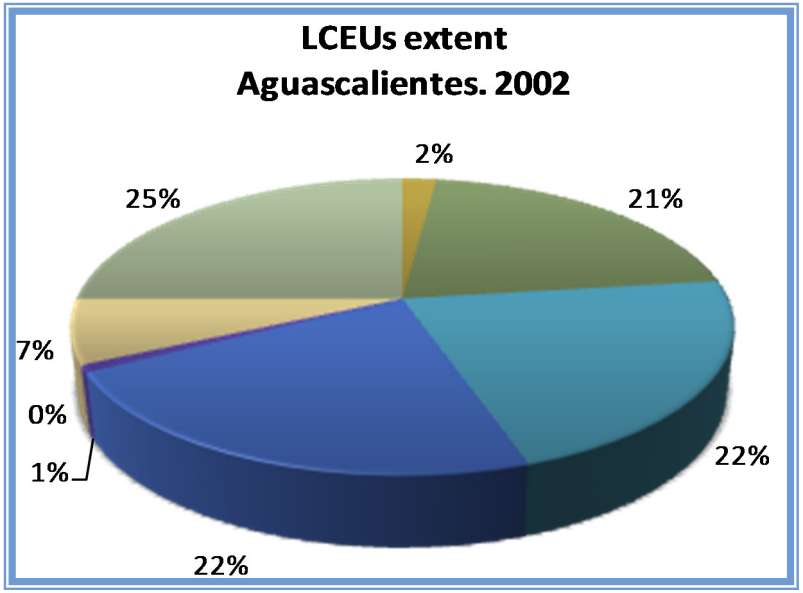
Surface belonging to permanent crops almost remained the same since 2002 to 2011, being around 0.99% in both series.

The land cover that has been more affected in the period among 2002 and 2011 was that destined to middle to big fields, rainfed herbaceous crops, which lost about 2% with respect to the year of 2002, this is possible to appreciate it in the next graphics.

Symbology

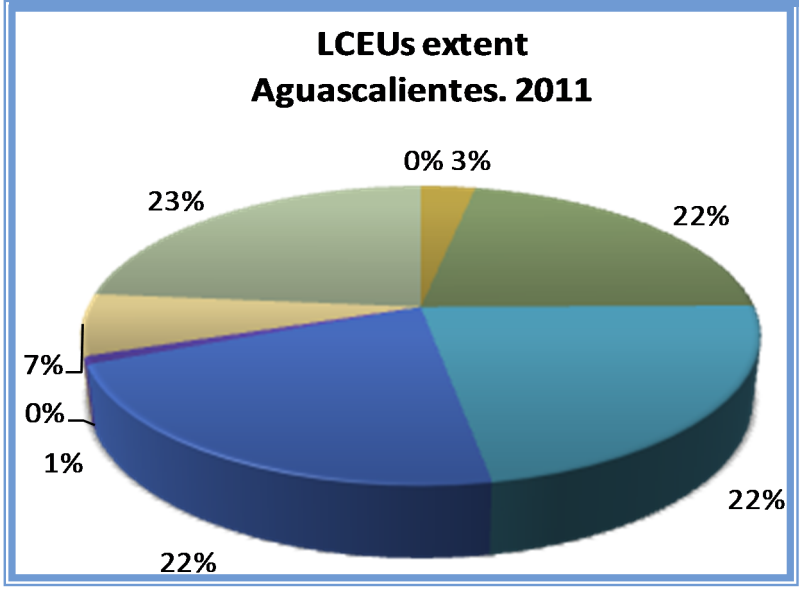
- Urban and associated developed areas
- Middle to big fields, rainfed herbaceous crops
- Middle to big fields, irrigated herbaceous crops
- Forest tree cover
- Continental water bodies
- Permanent crops, agricultural plantation
- Shrubland, bushland, heathland
- Pastures and natural grasslands
- Barren land

Graphic 3. Estatal LCEU extent in 2002.



INEGI (2012). Use and land cover *Serie III, scale 1:250,000.*

Graphic 4. Estatal LCEU extent in 2011.



INEGI (2012). Use and land cover *Serie V, scale 1:250,000.*

Figure 4. State maps of land and vegetation. cover Analysis units.

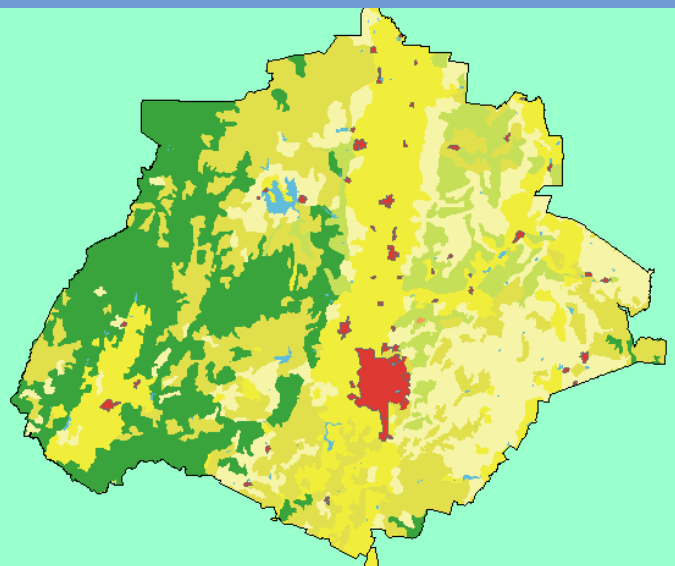
State of Aguascalientes

DATA SHEET

Map of use and land cover in accordance with INEGI's classification, Serie III (2002– 2005) and Serie V (2011-2013).
Scale: 1:250 000
Proyection: Albers Equal Area (datum ITRF92)
State: Aguascalientes.
Basic Spatial Unit (BSU): and induced pastures (25ha); vegetatives communities (50 ha); water bodies, islands, coastals, etc., consideraded with another criteria.

- Urban and associated developed areas
- Middle to big fields, rainfed herbaceous crops
- Middle to big fields, irrigated herbaceous crops
- Permanent crops, agricultural plantation
- Pastures and natural grasslands
- Forest tree cover
- Barren land
- Shrubland, bushland, heathland
- Continental water bodies

(2002)



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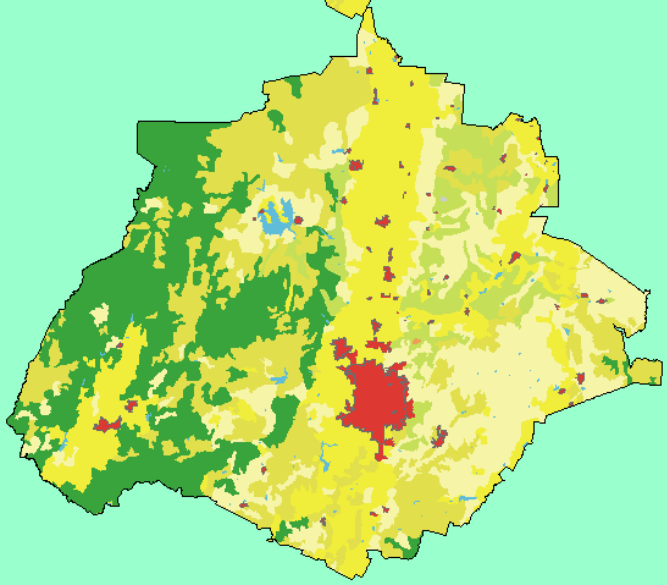


2.2 Tables of soil and vegetation cover changes

Soil and vegetation cover tables indicate changes, increases and/ or decreases, of the different types of ecosystems in two moments in the time, as well as the general causes that originated them. In this pilot study are presented changes between the years of 2002 and 2011.

The opening stock represents the extent of the ecosystems in the year of 2002, additions and reductions of the stock show the changes, by every action that originated them, at the end of the year, being at the closing stock where is showed total extent in the year of 2011 for each ecosystem.

As you can see, the increase of the stock of urban and associated developed areas was the unique controlated addition, whilst increase in water bodies

Table 4. Municipal balance table of soil and vegetation cover changes. 2002 and 2011. (Km^2).

Balance of land cover changes (Km^2)							
	Urban and associated areas	**Crops**	**Pastures**	**Forest tree cover**	**Shrubland**	**Barren land**	**Continental water bodies**
Stock opening resources (serie III)	**3.87**	**164.85**	**171.71**	**150.88**	**10.06**	**0.00**	**3.62**
Stock adittions							
Controlled expansion	12.42	NS	NA	NA	NA	NA	NA
Natural expansion	NA	NA	NA	NA	NA	NA	NA
Revaluation at high	NA	NA	NA	NA	NA	NA	0.39
Total additions in stock	12.42	NS	NA	NA	NA	NA	0.39
Stock reductions							
Controlled regression	NA	NA	NA	NA	NA	NA	NA
Natural regression	NA	NA	NA	NA	NA	NA	NA
Revaluation at down	NA	NA	NA	NA	NA	NA	NA
Total reductions in stock	NS	NA	7.12	4.75	0.94	NA	NA
Stock closing resources (serie V)	**16.29**	**164.86**	**164.58**	**146.13**	**9.12**	**0.00**	**4.01**

Soil and vegetation cover tables indicate changes, increases and/or decreases, of the different types of ecosystems in two moments on the time, as well as general causes that originated them.

was because of a reclassification in the serie V (2011).

Reductions occurred specially in pastures and forest tree cover, and in a less proportion in lands with shrubland.

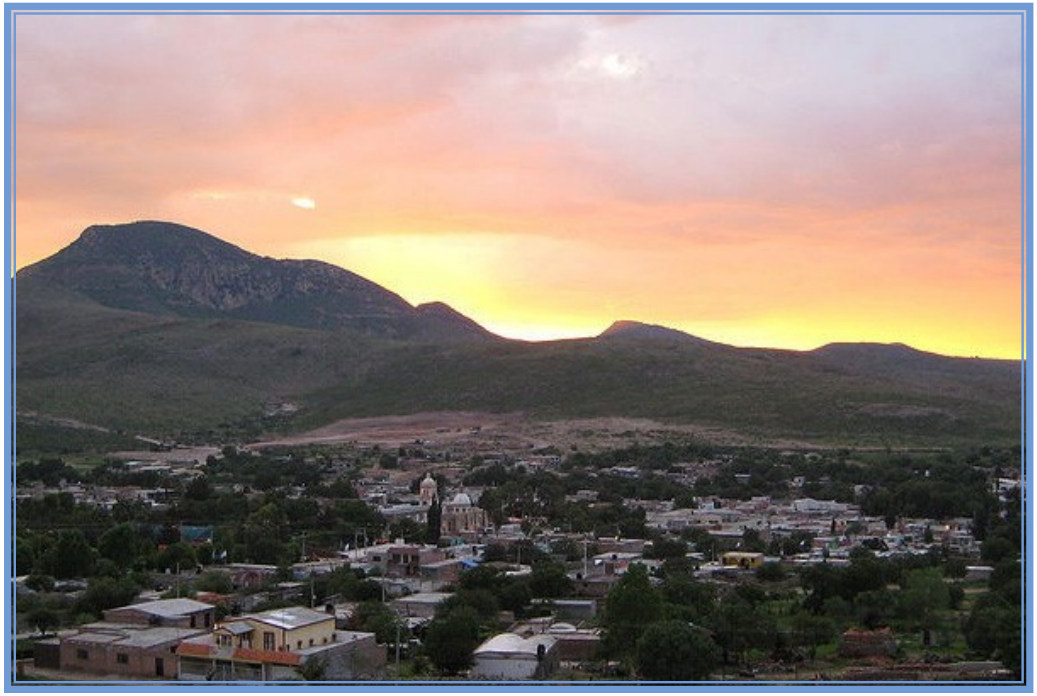
At state level, the dynamic of additions and reductions shows that urban areas, crops and barren land were expanded 133.61 km^2 and were revaluated 2.72 km^2 water bodies, while in other other hand, reductions were ocurred in pastures, forest tree cover and shrubland in the same period.

Table 5. State balance table of soil and vegetation cover changes. 2002 and 2011. (Km^2).

Balance of soil cover changes (Km^2)							
	Urban and associated areas	**Crops**	**Pastures**	**Forest tree cover**	**Shrubland**	**Barren land**	**Continental water bodies**
Stock opening resources (serie III)	**111.52**	**2,407.69**	**1,405.01**	**1,254.41**	**393.36**	**0.00**	**43.68**
Stock adittions							
Controlled expansion	63.63	69.36	NA	NA	NA	0.62	NA
Natural expansion	NA	NA	NA	NA	NA	NA	NA
Revaluation at high	NA	NA	NA	NA	NA	NA	2.72
Total additions in stock	63.63	69.36	NA	NA	NA	0.62	2.72
Stock reductions							
Controlled regression	NA	NA	NA	NA	NA	NA	NA
Natural regression	NA	NA	NA	NA	NA	NA	NA
Revaluation at down	NA	NA	NA	NA	NA	NA	NA
Total reductions in stock	NA	NA	83.62	33.08	19.63	NA	NA
Stock closing resources (serie V)	**175.14**	**2,477.05**	**1,321.40**	**1,221.33**	**373.73**	**0.62**	**46.40**

In Aguascalientes predominates crops cover, being almost half of the state territory, and from 2002 to 2011 were expanded in 2.88 percent. In 2002, a quarter part of Aguascalientes territory were conformed by pastures, that ecosystem lost almost 6% of its extent. In contrast, urban areas were expanded almost 60% from 2002 to 2011. The third largest ecosystem in the state is forest tree cover with around of 22% of total extent in the year of 2002, which was mainly located in the municipalities of Calvillo and San Jose de Gracia.

Source: La biodiversidad en Aguascalientes. Estudio de Estado. CONABIO.



Source: http://www.pueblosmexico.com.mx/pueblo_mexico_ficha.php?id_rubrique=341

Nevertheless, in 2011 was a reduction of 2.64% in its extent. Finally, shrubland are nearly 7% of the state territory and suffered a reduction around 5% for 2011.

Althought balance tables introduce us to dynamic of land cover changes, a matrix of land and vegetation cover changes of the next section where it can be identified the Exchange of land uses for each LCEU.

2.3 Matrix of soil and vegetation cover changes

Balance tables help to know the expansion and reduction in the ecosystem stock, however matrix of soil and vegetation cover changes (table 6 y Graphic 5) lets know in detail exchanges between ecosystems (Graphic 6), such as coverage which remained without changes from a period to other one.

Table 6 shows that in the year of 2011 urban areas occupied mainly irrigation crops and, in less quantity, other areas of temporary crops, pastures and shrubland. On the other hand temporary crops won land cover to pastures, forest tree cover, shrubland and irrigation crops[7].

Furthermore, pastures are the largest ecosystem in Aguascalientes that remained without changes. It is worth mentioning that permanent crops and barren land didn't suffer changes, and that forest tree cover remained the 98.2% from its original extent.

The dinamic of soil and vegetation cover changes in Aguascalientes lets us appreciate that urban areas have been expanding them over crops and pastures, furthermore that temporary crops are changing to irrigation crops.

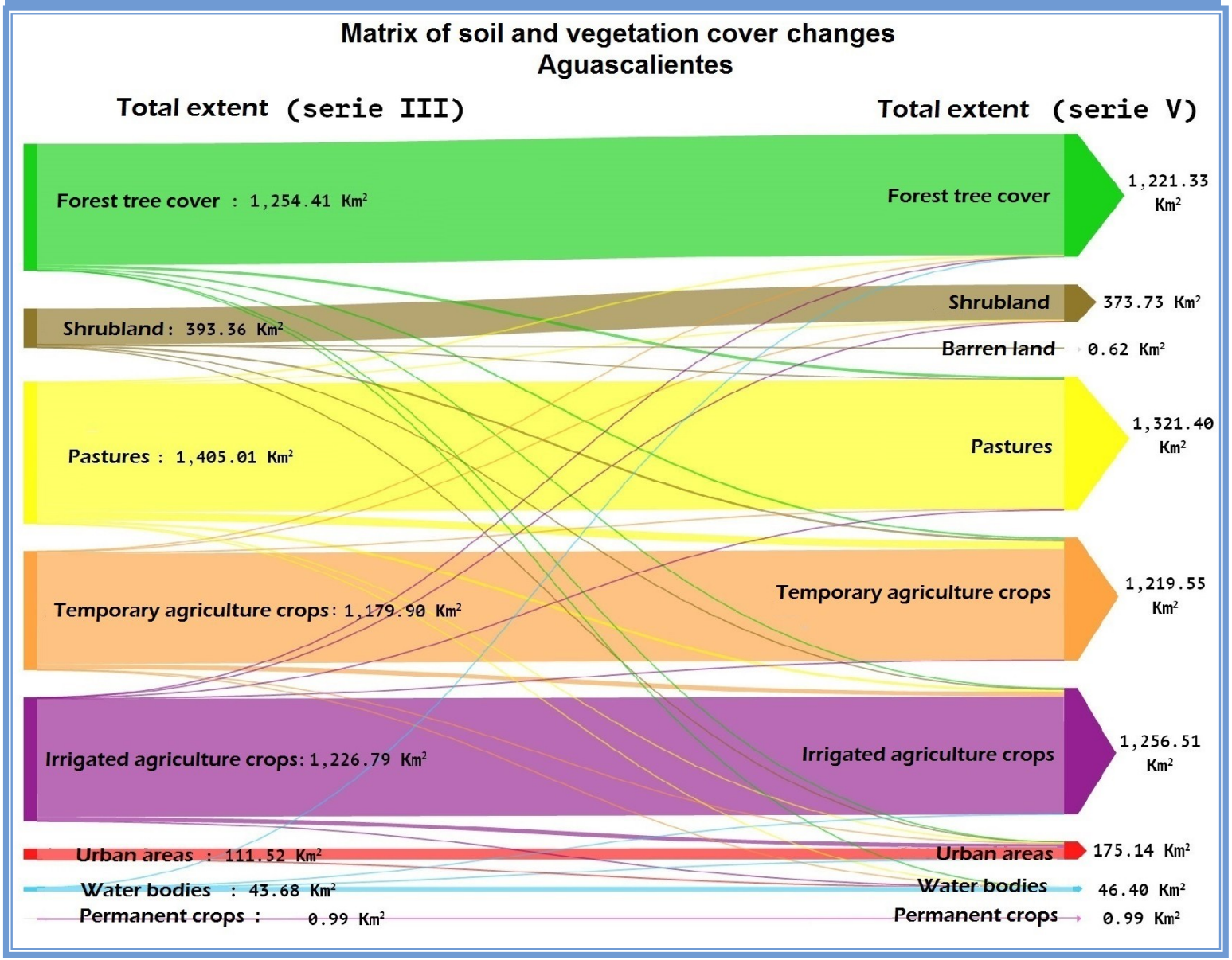
Another result from table 6 is that crops are expanding over pastures, and in the same way, pastures are expanding them above forest tree cover areas. The implications of those soil and vegetation cover changes are going to be analyzed at detail in supply and use account.

Source: https://www.tripadvisor.com.mx/LocationPhotos-g153976-w3-Aguascalientes_Central_Mexico_and_Gulf_Coast.html

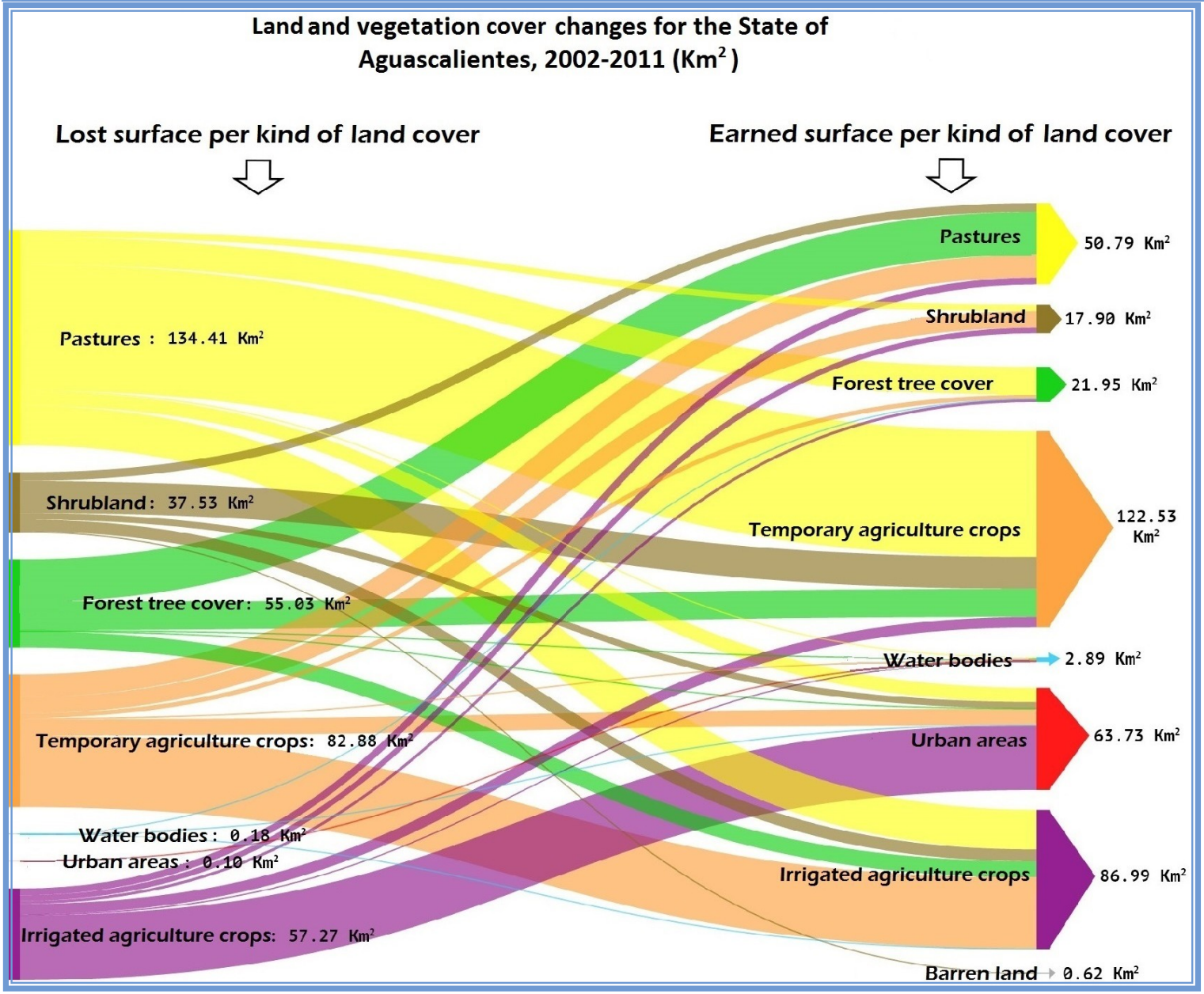
Table 6. State matrix of soil and vegetation cover changes 2002-2011.

Matrix of soil and vegetation cover changes for the state of Aguascalientes 2002-2011 (Km^2)										
Serie V / Serie III	Urban areas and developed associated	Middle to big fields, rainfed herbaceous crops	Middle to big fields, irrigated herbaceous crops	Permanent crops, agricultural plantation	Pastures and natural grasslands	Forest tree cover	Shrubland, bushland, heathland	Barren land	Continental water bodies	**Total**
Urban areas and developed associated	111.41	NS	NS	NA	NS	NA	NS	NA	0.10	**111.52**
Middle to big fields, rainfed herbaceous crops	10.18	1,097.02	44.65	NA	14.25	2.85	10.19	NA	0.76	**1,179.90**
Middle to big fields, irrigated herbaceous crops	40.44	6.55	1,169.52	NA	4.36	1.77	3.48	NA	0.67	**1,226.79**
Permanent crops, agricultural plantation	NA	NA	NA	0.99	NA	NA	NA	NA	NA	**0.99**
Pastures and natural grasslands	8.79	78.62	24.77	NA	1,270.61	17.28	4.23	NA	0.73	**1,405.01**
Forest tree cover	0.10	17.45	10.07	NA	26.76	1,199.39	0.00	NA	0.64	**1,254.41**
Shrubland, bushland, heathland	4.11	19.90	7.48	NA	5.42	NS	355.83	0.62	NS	**393.36**
Barren land	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.00**
Continental water bodies	0.11	NS	0.01	NA	NS	0.05	NS	NA	43.50	**43.68**
Total	**175.14**	**1,219.55**	**1,256.51**	**0.99**	**1,321.40**	**1,221.33**	**373.73**	**0.62**	**46.40**	**5,615.67**

Graphic 5. State matrix of soil and vegetation cover changes 2002-2011.



Graphic 6. Surface with land and vegetation cover changes 2002-2011.



[7] There are only register changes on surface (km^2), the numbers do not represent total surface of each type of land cover, unless losses and earnings. For that reason, surfaces which reamined without changes do not appear on this graphic (i.e. permanent crops).

3. ECOSYSTEM CONDITION ACCOUNT

Source: http://vivaaguascalientes.com/canon-y-presa-de-malpaso/

3. ECOSYSTEM CONDITION ACCOUNT

Ecosystem condition account presents the status which ecosystems have through their components, such as soil, water, carbon and biodiversity. This account constitutes a key part to know the impact of use and land cover changes on the ecosystem and its capacity to produce services that, in consequense, impacts economic production.

Source: http://bdi.conabio.gob.mx/fotoweb/Grid.fwx

Ecosystem condition account presents the status which ecosystems have through their components, such as soil, water, carbon and biodiversity.

Ecosystem condition account lets organizate biophysic information about the condition of different ecosystems through different variables, such as: types of soil, soil erosion, successional phases of vegetal cover, quality of superficial and undergrown water, wealth of species, relative abundance of species and endemic species.

Source: http://bdi.conabio.gob.mx/fotoweb/Grid.fwx

3.1 Soil condition

Soil is the substratum on which life is developed, it has the capacity to offer regulation service acting as a filter and transformer of contaminants produced by humans. It is important to know features of the different types of soil, being as combinate it with the weather allows the existence of different types of vegetal land cover, which provide services as catch of carbon and protection from floods. The information about type of soils was obtained from the National Compendium of Edaphology Serie II, scale 1:250,000 of INEGI.

3.1.1 Types of soil

Soils classification is realized according to FAO/UNESCO classification (1970) that has been adopted by Geography General Direction in the Edaphological Map. “In that classification is indicated the texture or quantity of sand, silt and clay on the superficial part of soil; the presence of chemical phases as salinity and quantity of sodium; and the presence of physics phases as rocks or cemented stratums near from superficial part of land or fragments of them on the surface of itself”.

Source: La biodiversidad en Aguascalientes. Estudio de Estado. CONABIO.

Table 7. Municipal table of types of soil.

Table of types of soil in the municipality of Calvillo.														
CALVILLO	Ecosystem extent	TYPES OF SOIL * (%)										Subtotal	Discrepancy	TOTAL
Type of LCEU**	Area (km^2)	CL	CM	DU	FL	KS	LP	LV	PH	PL	RG			
Temporary crops land	**49.74**	1.60			1.62	3.91	14.96	5.59	47.56	3.29	21.46	**100.00**	0.00	**100.00**
Irrigated crops land	**191.43**	12.20	5.83		12.33	8.08	0.55		12.45		48.56	**100.00**	0.00	**100.00**
Permanent crops														
Pastures and natural grasslands	**116.97**						13.66	6.65	42.55	15.32	21.82	**100.00**	0.00	**100.00**
Forest tree cover	**567.67**	4.57	5.80		0.10	0.34	33.12	9.19	37.34	1.29	8.26	**100.00**	0.00	**100.00**
Shrubland, bushland, heathland														
Sparsely vegetated areas														
Barren land														
Discrepancy***	**0.00**	8.52	5.42	0.00	6.88	4.72	13.92	3.92	24.16	1.11	31.35	**100.00**	0.00	**100.00**
Total	**925.81**	**5.41**	**4.76**	**0.00**	**2.70**	**2.09**	**22.95**	**6.78**	**33.40**	**2.90**	**19.01**	**100.00**		**100.00**

Types of soil in every Land Cover Ecosystem Unit (LCEU), are determinated combining information from the LCEU selected with the Map of Soil uses and vegetation Serie IV, scale 1:250,000.

From this work derive the tables of types of soil for each EAU, with the LCEU placed in the rows and the percentage of extent for every type of soil in the columns.

For this part of the exercise it is only used the primary classification of soil groups in accordance with the next denomination.

Table 8. Primary Classification os Groups of Land.

Edaphological units.					
Code	Name	**Code**	Name	**Code**	Name
AC	Acrisol	**GL**	Gleysol	**PL**	Planosol
AL	Alisol	**GY**	Gipsisol	**PT**	Plintosol
AN	Andosol	**HS**	Histosol	**RG**	Regosol
AR	Arenosol	**KS**	Kastañozem	**SC**	Solonchak
CH	Chernozem	**LP**	Leptosol	**SN**	Solonetz
CL	Calcisol	**LV**	Luvisol	**UM**	Umbrisol
CM	Cambisol	**LX**	Lixisol	**VR**	Vertisol
DU	Durisol	**NT**	Nitisol		
FL	Fluvisol	**PH**	Phaeozem		

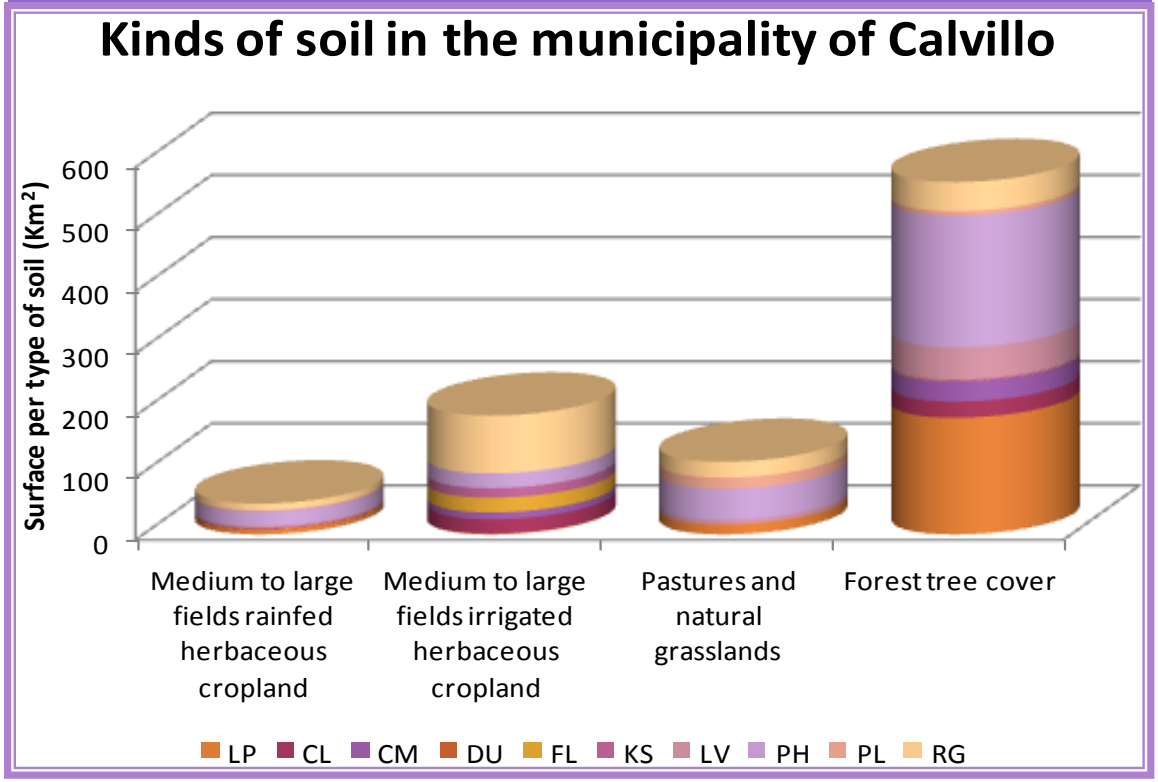
Source: INEGI, *Diccionario de datos edafológicos, escala 1:250,000*, México, 2009.

Source: La biodiversidad en Aguascalientes. Estudio de Estado. CONABIO.

In the annex I is presented an extract of the "*Guía para la interpretación de cartografía edafológica. Unidades y subunidades de suelo"* of INEGI, where have a short description of every type of land.

The information of the municipality of Calvillo lets us appreciate that phaeozem is the prepoderant type of soil, which can be interpretated as it is available for pastures zones or for vegetation with a low demand of water. The percentage distribution of types of soil is illustrated in the next graphic.

Graphic 7. Kinds of soil. Municipal.



INEGI (2012). Barren Land *Serie, scale 1:250,000.*

Source: La biodiversidad en Aguascalientes. Estudio de Estado. CONABIO.

Source: La biodiversidad en Aguascalientes. Estudio de Estado. CONABIO.

The analysis at state level is obtained adding information from all municipalities, such as in the next table.

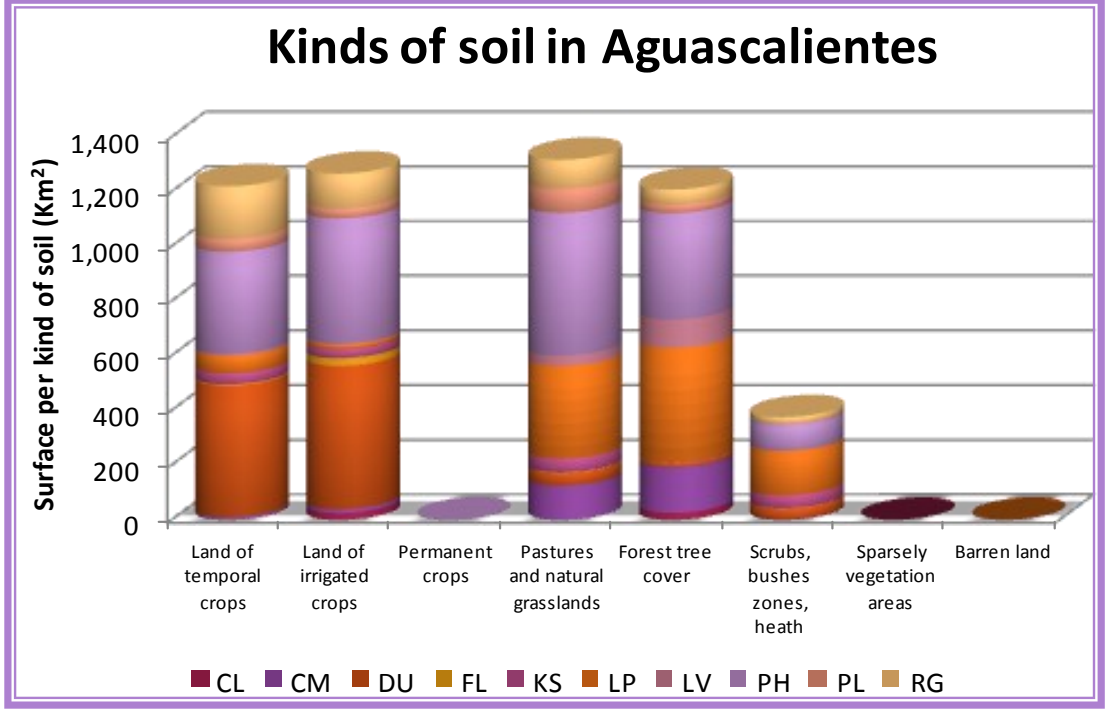
Table 9. State table of types of soil.

Table of types of soil. Aguascalientes														
STATE RESULTS	Ecosystem extent	TYPES OF SOIL * (%)										Subtotal	Discrepancy	TOTAL
Types of LCEU**	Area (Km^2)	CL	CM	DU	FL	KS	LP	LV	PH	PL	RG			
Temporary crops land	**1,219.88**	0.07	0.77	39.42	0.38	3.27	5.29	0.61	30.54	3.79	15.86	**100.00**	0.00	**100.00**
Irrigated crops land	**1,266.32**	1.97	1.10	41.38	2.23	2.58	1.31	0.28	36.20	2.80	10.14	**99.99**	0.01	**100.00**
Permanent crops	**0.99**								100.00			**100.00**	0.00	**100.00**
Pastures and natural grasslands	**1,316.90**		9.49	3.43	0.21	3.84	25.75	2.90	39.63	6.78	7.98	**100.00**	0.00	**100.00**
Forest tree cover	**1,231.70**	2.11	13.54	0.98	0.05	0.26	34.11	8.42	31.57	2.55	4.46	**98.05**	1.95	**100.00**
Shrubland, bushland, heathland	**375.42**	0.82		10.15	0.39	12.36	43.49		25.78	0.63	6.37	**100.00**	0.00	**100.00**
Barren land	**0.62**						100.00					**100.00**	0.00	**100.00**
Discrepancy***	**24.15**	2.14	13.72	1.25	0.06	0.28	34.59	8.53	32.22	2.61	4.60	**100.00**	0.00	**100.00**
Total	**5,435.99**	**1.02**	**5.86**	**20.25**	**0.69**	**3.18**	**18.63**	**2.85**	**33.98**	**3.78**	**9.33**	**99.56**	**0.44**	**100.00**

In the table 9 is appreciated that in Aguascalientes the phaeozem soil prevails (33.9%), following by durisol (20.3%) and leptosol (18.6%). This means that the preopoderant soil has wealth in organic material and nutrients. The distribution percentage is shown in the next graphic for each LCEU.

The Erosion Serie includes, at first, three types of erosion: hydric, wind and anthropic; furthermore of stable land, geomorphological units and complementary units. Hydric erosion can be in many ways: laminar, grooves and guillies, and in four grades: mild, moderate, strong and extreme.

Graphic 8. Types of soil in the State.



INEGI (2012). Barren Land *Serie, scale 1:250,000.*

3.1.2 Erosion tables

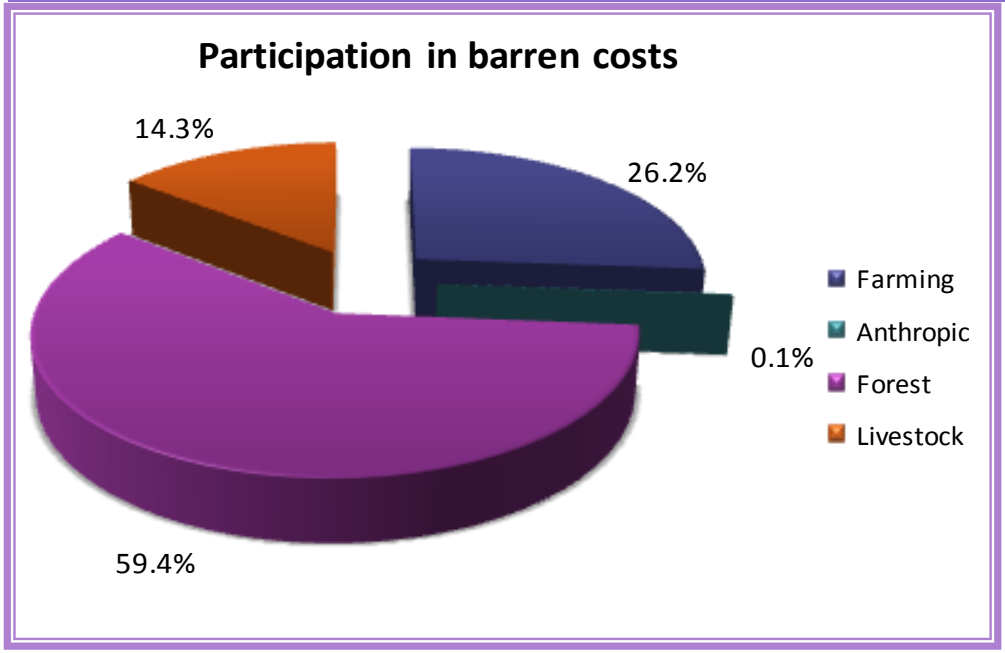
Erosion tables present on the cross of the information of the Map of soil uses and vegetation Serie V and the Serie I of Erosion of soil[4], to identify eroed surface for each LCEU. The Erosion Serie includes, at first, three types of erosion: hydric, wind and anthropic; furthermore of stable land, geomorphological units and complementary units.

Hydric erosion can be in many ways: laminar, grooves and guillies, and in four grades: mild, moderate, strong and extreme. The structure of the erosion layer and the codes used to the tables can be consulted on the annex I.

In the following example, the municipality of Jesus María presents the erosion registred on three levels as it can be appreciated on the table 10.

With lost soil estimation for type of use of land and grade of affectation was possible to get results in monetary units. That is how it is known that for give back to soil its features and it can continue providing its services, it is necessary a delivery of almost 126 millions 927 thousand pesos for the year of 2012. The distribution of costs according to the type of use of land would be as the next way: the 26.2% of the costs corresponds to agriculture, for livestock land the costs are equivalent to 14.3%, while the 0.1% are required for anthropic erosion, the rest (59.4%) should be applicated to forest lands.

Graphic 9. Participation in the remediation cost by type of use of soil, municipality of Jesus Maía.



Source: La biodiversidad en Aguascalientes. Estudio de Estado. CONABIO.

Table 10. Results of municipal estimate of hydric erosion.

Type of LCEU**	Laminar hydric				Grooves hydric				Gullies hydric				Eolic			Subtotal of eroed area	Anthropic	Total
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3			
Temporary crops land	4,030	2,344	5				295		23,099		69					**8,031**	67	**8,098**
Irrigated crops land	10	926	78			520			1,652		196					**1,642**	0	**1,642**
Permanent crops																		
Pastures and natural grasslands	335	3,391	23						13,694		729					**7,388**		**7,388**
Forest tree cover	964	13,847	93			20	157		52,881		7,389					**19,114**	23	**19,137**
Total	5,340	20,508	199			540	452		91,326		8,384					**126,838**	89	**126,927**

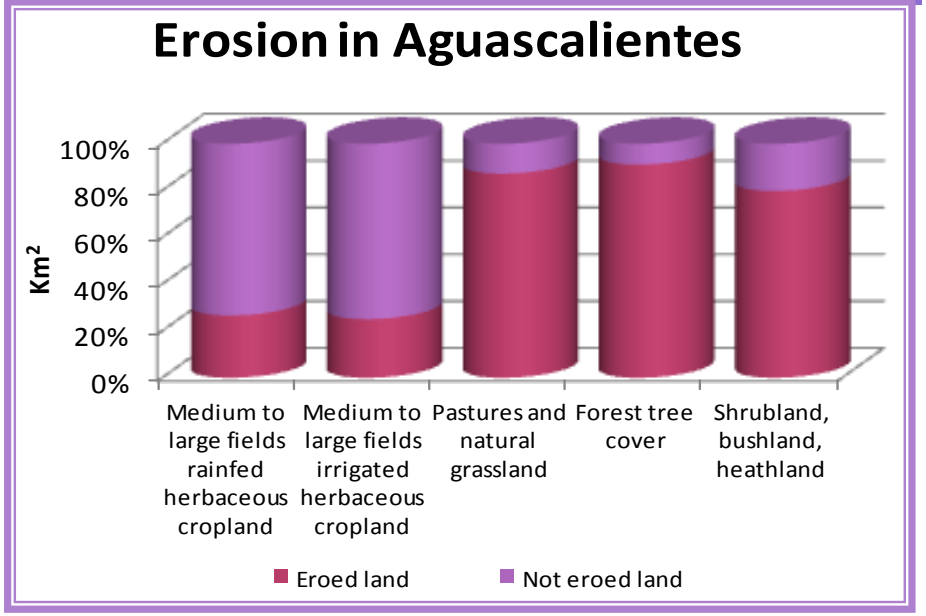
Table 11. Table of state erosion.

State results	Ecosystem extent	Erosion land units (%)*															Subtotal of eroed area	Stable land (km^2)	Geomorphological units (%)	Complementary units (%)				Subtotal of no eroed area	Discrepancy ***	Total
Type of LCEU**	Area (Km^2)	Laminar hydric				Grooves hydric				Gullies hydric				Eolic			Anthropic				AH	H_2O	Islands	ZU			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3										
Temporary crops land	100	2.87	13.93	2.33	0.11	0.23	0.31	0.18		4.56	0.09	0					0.08	**24.7**	65.7	1.12	1.26	0		0	**68.08**	7.22	**100**
Irrigated crops land	100	12.88	4.07	1.92		2.82	0.07	0.04		2.44	0.14	0.12					0.55	**25.05**	69.16	4.02	1.76	0		0.01	**74.95**	0	**100**
Permanent crops	100		0.49				8.36											**8.85**	91.15						**91.15**	0	**100**
Pastures and natural grasslands	100	25.42	39.32	9.44	0.97	0.01	0.41	0.41		10.42	0.04	0.61					0.17	**87.23**	11.81	0.82	0.14	0		0	**12.77**	0	**100**
Forest coverage	100	33.9	37.21	3.11	0	0.69	0.06	0.03		14.22	1.43	0.41					0.02	**91.07**	7.1	1.78	0.05	0			**8.93**	0	**100**
Shrubland, bushland, heathland	100	17.17	50.05	8.11		1.47	0.23			1.68	0						1.13	**79.85**	18.69	0.03	1.43	0		0	**20.15**	0	**100**
Barren land	100										0.12						99.88	**100**	0.03						**0.03**	-0.03	**100**
Discrepancy ***	100	3.09	15.01	2.52	0.12	0.25	0.34	0.2		4.91	0.09	0					0.08	**26.62**	70.81	1.21	1.36	0		0	**73.38**	100	**100**

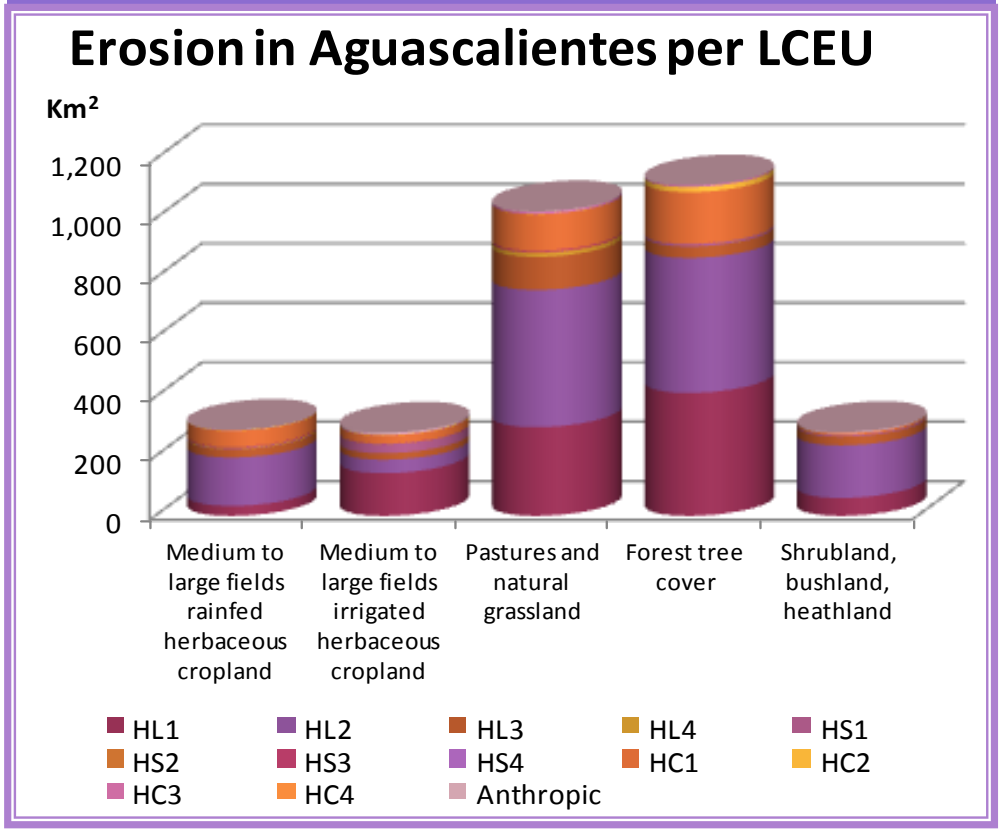
AH: Human Settlements, H_2O: Water bodies, Islands: islands or islets, ZU: Urban Zones.

Respect to the state information, it shows that 60.0% of the state surface is eroded. Almost 24.7% of the surface of the temporal land crops is eroded too, such as the 25.1% of the irrigated land, the 8.85% of the permanent crops, the 87.2% of the pastures, the 91.1% of the forest tree cover, the 79.9% of scrubs and 100% of land barren.

Graphic 10. State surface eroded and not eroded by type of LCEU (km^2)



Graphic 11. State eroed surface by type of LCEU and erosion category.



3.1.3 Vegetation condition tables

Vegetation condition tables make out between primary and secondary vegetation, according to the successional phases of vegetation registered in the maps of land uses and vegetation Series III and V by INEGI.

Primary vegetation corresponds to that with regular size characteristic of the ecosystem. While, secondary vegetation implies fragmentation of the ecosystem, presence of invasive of species and vegetation smaller than regular, that can be indicator of a decaying ecosystem or in recovery.

To illustrate this type of tables it is presented the case of the municipality of Jesus Maria, which information is in the tables of the next page, where, althought it seems it has an important forest tree cover extension, almost 90% of this is secondary vegetation. Pastures presents nearly the same proportion of primary and secondary vegetation. Scrubs only includes primary vegetation.

Vegetation condition tables make out between primary and secondary vegetation, according to the successional phases of vegetation

Source: http://bdi.conabio.gob.mx/fotoweb/Grid.fwx

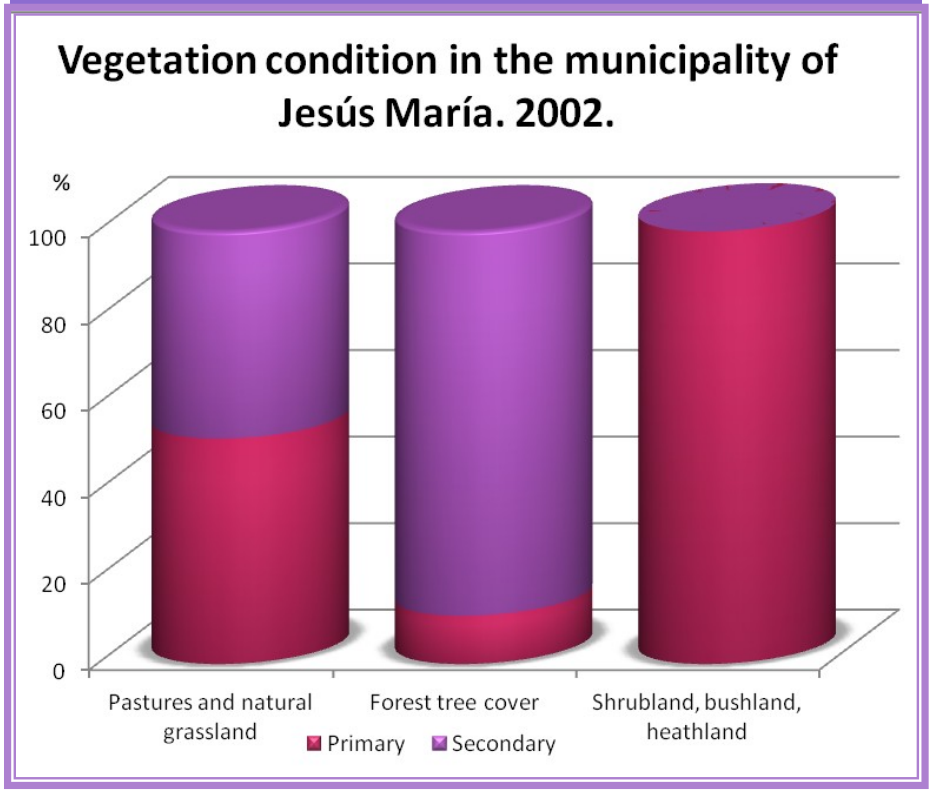
Table 12. Vegetal coverage and condition classifications.

Vegetation coverage and condition classifications		
INEGI classification	**SEEA classification**	**Vegetation condition**
Natural pastures	Pastures and natural grassland	Primary vegetation
Induced pastures		Secondary vegetation
Secondary bushes vegetation of natural pastures		
Pine oak forest	Forest tree cover	Primary vegetation
Oak forest		
Secondary bushes vegetation of oak forest		Secondary vegetation
Secondary three vegetation of oak forest		
Secondary bushes vegetation of low caducifolia jungle		
Crasicaule shrubland	Shrubland, bushland, heathland	Primary vegetation
Secondary bushes vegetation of crasicaule scrubs		Secondary vegetation

Table 13. Municipal vegetation condition table 2002-2011.

Vegetation condition in the municipality of Jesus Maria						
Type of LCEU*	**Ecosystem extent**	**Serie III (2002)**		**Ecosystem extent**	**Serie V (2011)**	
		Vegetation condition (%)			**Vegetation condition (%)**	
	Area (Km^2)	**Primary**	**Secondary**	**Area (Km^2)**	**Primary**	**Secondary**
Pastures and natural grassland	**171.71**	52.12	47.88	**164.58**	51.93	48.07
Forest tree cover	**150.88**	11.16	88.84	**146.13**	9.93	87.23
Shrubland, bushland, heathland	**10.06**	100.00	0.00	**9.12**	100.00	0.00

Graphic 12. Municipal vegetation condition 2002.



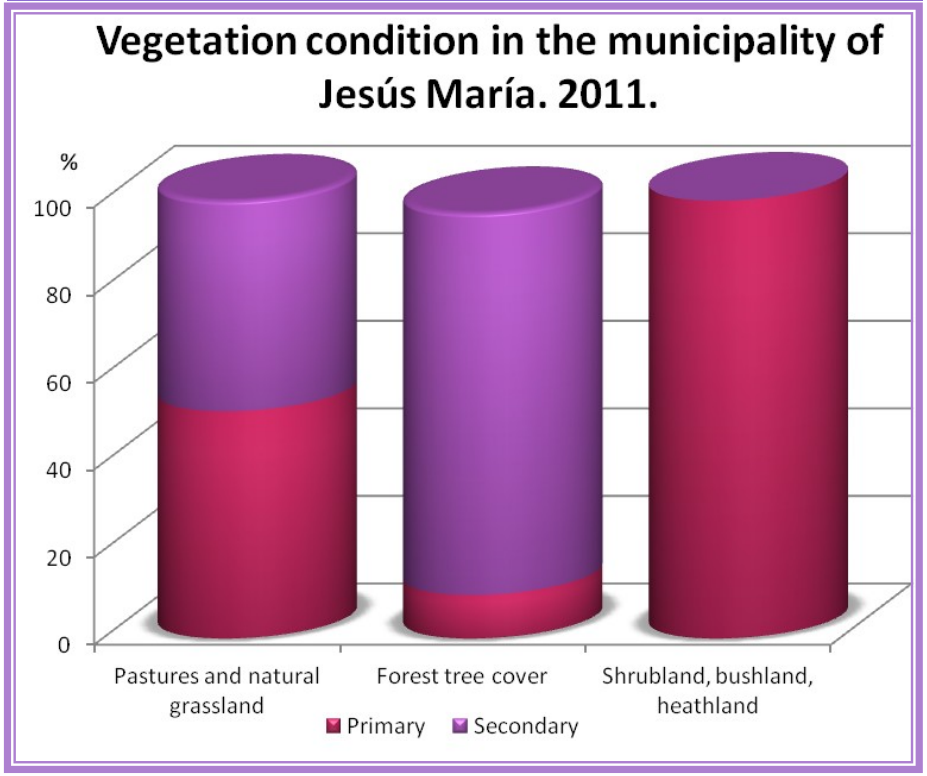
INEGI (2012). Use and land cover *Serie III, scale 1:250,000.*

As it was mentioned, the information of land and vegetation cover condition was adapted according to SEEA classification. In the table 12 there are these classifications, beside corresponding vegetation condition (primary or secundary). With this information could be possible obtain the information presented in the table 13, where was obtained the extent of each ecosystem according to vegetation condition.

On the next graphics it can be appreciated the distribution of primary and secondary vegetation of the three types of LCEU that were mentioned in table 13. Everyone of the graphics correspondes to one of the two series used in this project (Serie III and Serie V).

From this information it is possible to appreciate that from the year of 2002 to 2011 the municipality of Jesus Maria has not suffered many changes in matter of forest tree cover.

Graphic 13. Municipal vegetation condition 2011.



INEGI (2012). Use and land cover *Serie V, scale 1:250,000.*

In the same way that previous exercises, the activities were done in municipal and state form, and those results are presented in the next table.

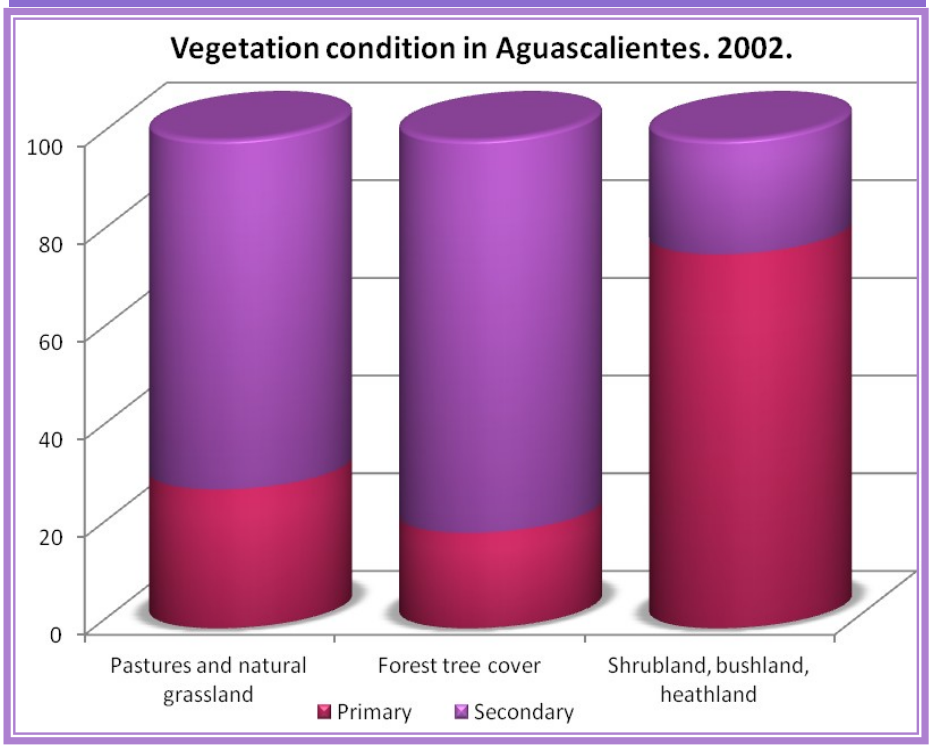
Table 14. State vegetation condition table 2002-2011.

Vegetation condition in the state of Aguascalientes						
Type of LCEU*	**Ecosystem extent**	**Serie III (2002)**		**Ecosystem extent**	**Serie V (2011)**	
		Vegetation condition (%)			**Vegetation condition (%)**	
	Area (Km^2)	**Primary**	**Secondary**	**Area (Km^2)**	**Primary**	**Secondary**
Pastures and natural grassland	**1,089.04**	28.44	71.56	**678.41**	20.39	45.82
Forest tree cover	**776.57**	19.56	80.44	**756.61**	19.91	73.25
Shrubland, bushland, heathland	**381.85**	76.57	23.43	**293.60**	49.54	50.46

State results show that in 2011 around that the fifth part of pastures and forest tree cover correspond to primary vegetation, and the half of shrubland includes secondary vegetation.

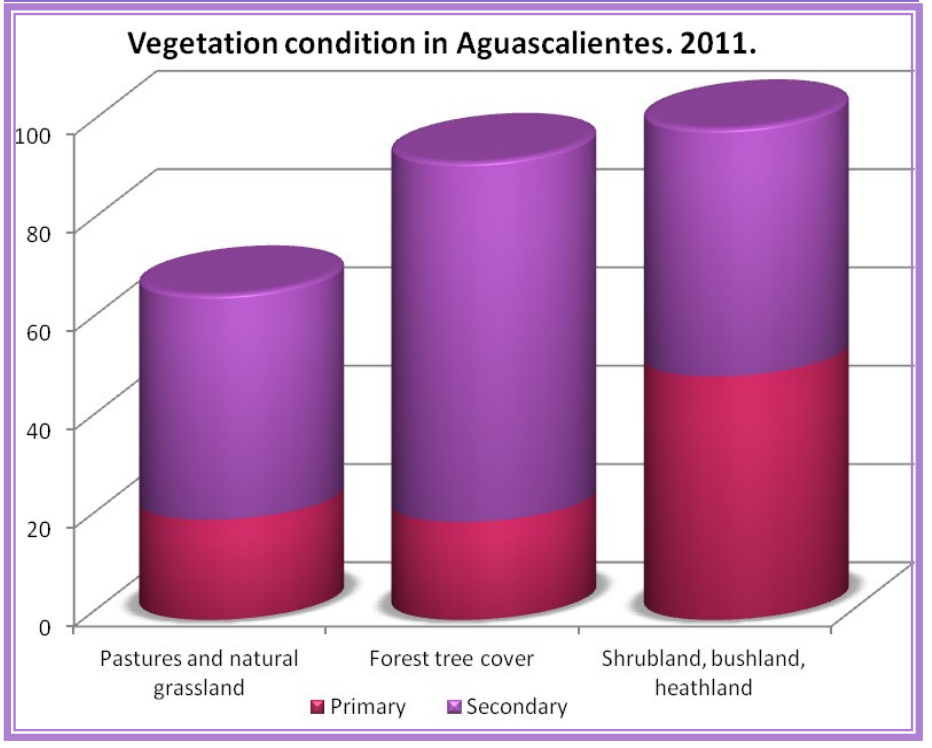
Furthermore it is remarkable, that secondary vegetation condition corresponding to scrubs has increased in the year of 2011 from the year of 2002.

Graphic 14. State vegetation condition 2002.



INEGI (2012). Use and land cover *Serie III, scale 1:250,000.*

Graphic 15. State vegetation condition 2011.



INEGI (2012). Use and land cover *Serie V, scale 1:250,000.*

3.2 Carbon

Carbon component is used as indicator of the condition of the ecosystems due to shows the capacity of ecosystems to provide carbon kidnaping and storage services; carbon kidnaping refers to the catch done by the live material of carbon on the atmosphere as part of their biological process, while carbon storage corresponds to the carbon already storaged in the biosphere or in the geosphere and it is important to keep it there to avoid it liberation to the atmosphere.

Carbon stocks are register dividing them into geocarbon (carbon storaged in the geosphere, as example in the gas or petrol repositories and in certain minerals as limestone) and biocarbon (carbon storaged in the biosphere), last one is divided in carbon in live biomass and carbon in biomass in descomposition. Ecosystems Experimental Accounting focus on biocarbon, that can be classificated by type of ecosystem.

Carbon component is used as indicator of the condition of the ecosystems due to shows the capacity of ecosystems to provide carbon kidnaping and storage services.

Source: http://centromariomolina.org/contaminacion-y-salud-ambiental/

3.2.1. Organic carbon in land

In this section are presented tables of organic carbon stock in land. In these is recordered the carbon stock in every type of LCEU in three accountant periods. For that it is crossed information from maps of land use and vegetation Series III, IV and V with information collected by INEGI for calculate tonnes of carbon by hectare average of everyone of the 180 classifications of use and land cover, as part of the works on the National Map of Organic Carbon in Land. Calculation of carbon in land corresponds only to the first 30 centimeters of depth, according to the recommendations of the Intergovermental Panel on Climate Change (IPCC). Due to it is used an average in tonnes of carbon by hectare of just one moment in the time, the variations in the stock are estimated according to the variations in the extent of LCEUs.

In the municipality of Jesus María, forest tree cover catch an average of 35 tonnes of carbon by hectare; followed by temporal crops with an average of 30 tonnes by hectare; while irrigated crops storage 27 tonnes by hectare. The capacity of shrubland and pastures is similar, with an average of 25 tonnes by hectare. Through this exersice is possible to know tha as less forest tree cover the municipality has, the quantity of carbon catched is less.

Organic carbon storage in the land of the state of Aguascalientes was more than 15.6 millions of tonnes in the year of 2002, and had a trend at low derived from the changes in land coverage and vegetation, until 15.4 million of tonnes in 2011.

Organic carbon storage in land of the state of Aguascalientes was more than 15.6 millions of tonnes in the year of 2002, and had a trend at low derived from the changes in land coverage and vegetation, until 15.4 million of tonnes in 2011. Examples of those changes is the reduction in the forest tree cover and the extent of urban areas and irrigated crops.

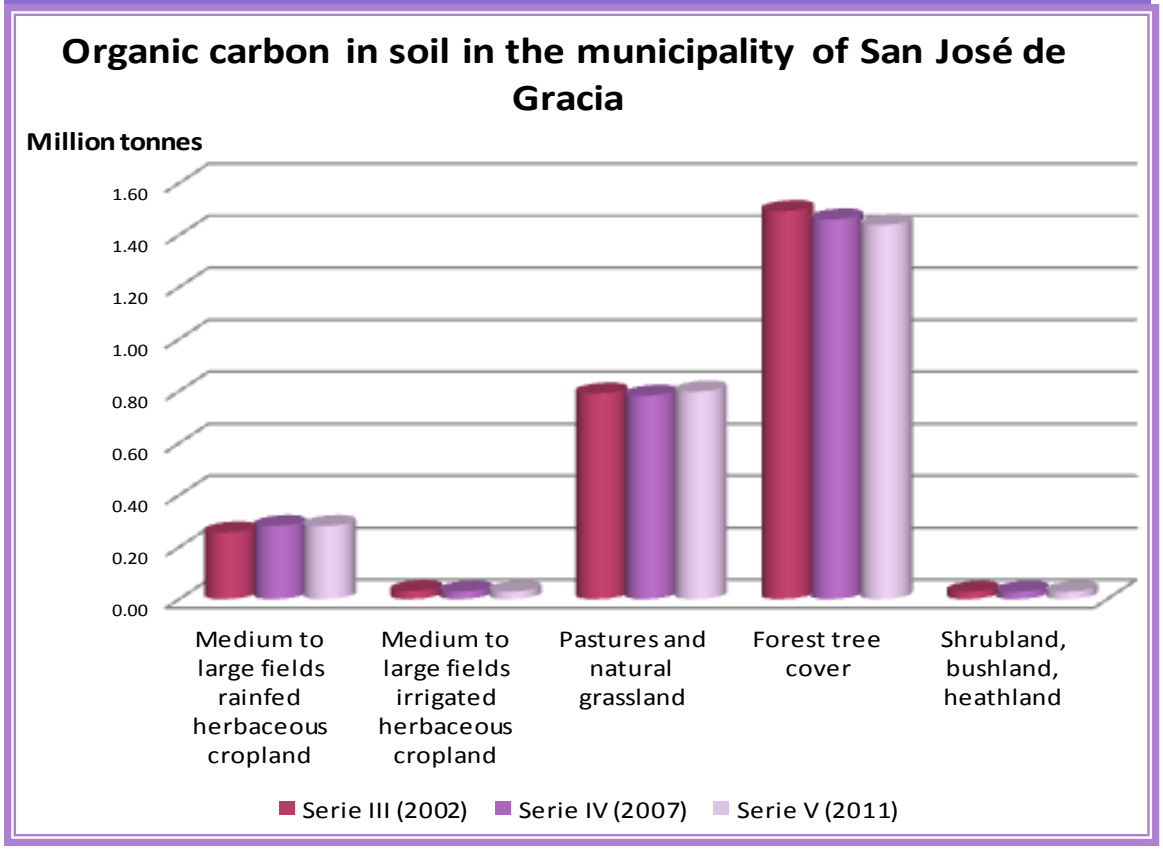
[5]Programa de Naciones Unidas para el Desarrollo (2014). *Mapa Nacional de Carbono Orgánico en el Suelo*. With quatitive data from INEGI, 1968-2012 and National Forestry Commission, 2009-2014.

[6]Intergovernmental Panel on Climate Change (2006). *Directrices del IPCC de 2006 para los inventarios nacionales de gases de efecto invernadero, Volumen 4, Agricultura, silvicultura y otros usos de la tierra*.

The different types of forest tree cover (primary and secondary vegetation) have a diverse capacity of carbon capture, at state level forest tree cover capture 33 tonnes of carbon per hectare on average, it is less than permanent crops, which in average catch 36 tonnes by hectare.

Source: La biodiversidad en Aguascalientes. Estudio de Estado. CONABIO.

Graphic 16. Organic carbon in municipal land 2002,2007, 2011.



INEGI (2012). **Use and land cover** *Serie III, IV and V, scale 1:250,000.*

Temporal crops catch on average 30 tonnes per hectare, whilst irrigated crops catch about 27 tonnes per hectare. Scrubs average 25 tonnes per hectare, while pastures average around 24 tonnes per hectare. Finally, on barren land was registered on average 28 tonnes per hectare.

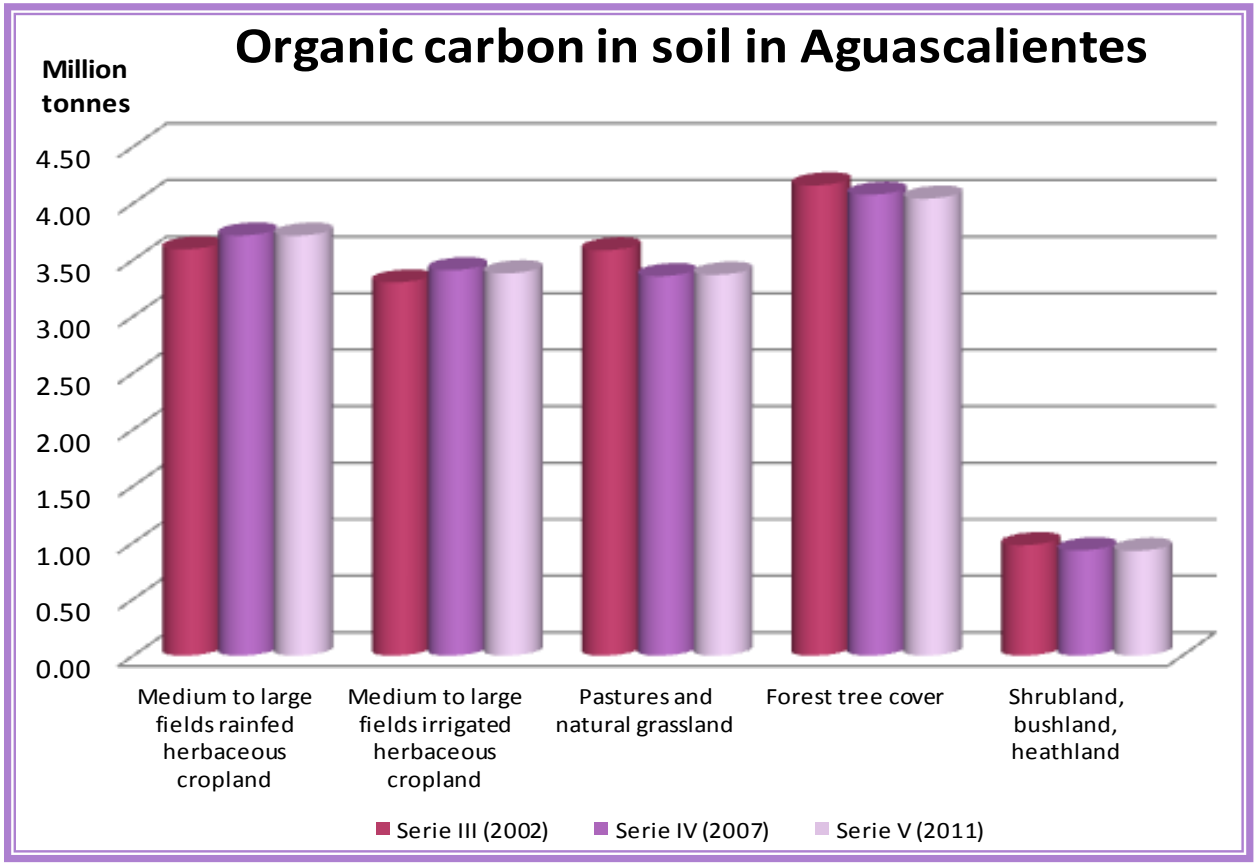
Table 15. Municipal table of organic carbon in land 2002, 2007, 2011.

ORGANIC CARBON IN SOIL. SAN JOSÉ DE GRACIA						
Type of LCEU	**Serie III (2002)**		**Serie IV (2007)**		**Serie V (2011)**	
	Area (Km^2)	**Tonnes**	**Area (Km^2)**	**Tonnes**	**Area (Km^2)**	**Tonnes**
Urban and associated developed areas	1.60	NA	1.60	NA	1.60	NA
Temporary crops land	84.96	256,482.68	93.14	281,180.13	93.14	281,180.08
Irrigated crops land	11.67	31,122.09	10.87	28,999.11	10.87	28,999.12
Permanent crops	NA	NA	NA	NA	NA	NA
Pastures and natural grassland	315.99	790,705.77	313.18	782,190.03	319.77	798,178.91
Forest tree cover	419.25	1,492,319.27	414.71	1,460,208.36	408.12	1,438,635.80
Shrubland, bushland, heathland	11.51	28,625.10	11.47	28,524.33	11.47	28,524.39
Barren land	NA	NA	NA	NA	NA	NA
Total	844.98	2,599,254.91	844.97	2,581,101.95	844.97	2,575,518.30

Table 16. State table of organic carbon in land 2002, 2007, 2011.

ORGANIC CARBON IN SOIL. AGUASCALIENTES						
Type of LCEU	**Serie III (2002)**		**Serie IV (2007)**		**Serie V (2011)**	
	Area (Km^2)	**Tonnes**	**Area (Km^2)**	**Tonnes**	**Area (Km^2)**	**Tonnes**
Urban and associated developed areas	**111.52**	NA	**160.15**	NA	**175.14**	NA
Temporary crops land	**1,179.92**	3,592,343.84	**1,219.88**	3,714,166.38	**1219.56**	3,713,158.10
Irrigated crops land	**1,226.79**	3,299,129.62	**1,266.32**	3,407,779.85	**1256.51**	3,380,516.31
Permanent crops	**0.99**	3,618.33	**0.99**	3,618.33	**0.99**	3,618.33
Pastures and natural grassland	**1,405.02**	3,583,658.68	**1,316.90**	3,355,199.70	**1321.4**	3,367,926.06
Forest tree cover	**1,254.41**	4,158,087.56	**1,231.70**	4,075,378.02	**1221.35**	4,040,489.82
Shrubland, bushland, heathland	**393.36**	976,815.75	**375.42**	930,339.46	**373.73**	926,124.46
Barren land	**NA**	NA	**0.62**	1,718.51	**0.62**	1,718.51
Total	**5,572.01**	**15,613,653.79**	**5,571.99**	**15,488,200.25**	**5569.3**	**15,433,551.59**

Graphic 17. Organic carbon in state land 2002, 2007, 2011.



INEGI (2012). **Use and land cover** *Serie III, IV and V, scale 1:250,000.*

Source: http://www.mexconnect.com/photos/8733-15-del-aguasalientes-mexico-p-the-presa-de-malpaso-dam-in-aguascalientes-is-located-on-f

3.3 Water condition

Tables of water condition register water quality which is provisioned for an ecosystem. Being the first step the register of extracted water (before treatment) and sorting it by quality grade of resource (excelent, good quality, acceptable, contaminated o strongly contaminated).

3.3.1 Superficial water

In the case of superficial water, its tables are builded with information from the Water Quality Monitoring Network of the National Comission of Water (CONAGUA), which uses three indicators of water quality: Total Supended Solids (TSS), Biochemichal Oxygen Demand (BOD_5) y Chemical Oxygen Demand (COD), which criteria and parameters are described in the next page.

Source: http://www.aguascalientes.gob.mx/Estado/municipios/sanjose.aspx

Table 17. Indicators of superficial water quality.

Indicators of superficial water quality		
Criteria (mg/l)	**Classification**	**Features**
Biochemical Oxygen Demand (BOD_5)		
$BOD_5 \leq 3$	Excelent	Not contaminaded
$3 < BOD_5 \leq 6$	Good quality	Superficial water with low content of biodegradable organic material.
$6 < BOD_5 \leq 30$	Acceptable	Indication of contamination. Superficial water with self-purification capacity or biologically treated residual water discharge.
$30 < BOD_5 \leq 120$	Contaminaded	Superficial water with raw residual water discharges, mainly of municipal origin.
$BOD_5 > 120$	Strongly contaminaded	Superficial water with strong impact of discharges of municipal and not municipal raw residual water.
Chemical Oxygen Demand (COD)		
$COD \leq 10$	Excelent	Not contaminaded.
$10 < COD \leq 20$	Good quality	Superfical water with low content of biodegradable and not biodegradable organic material.
$20 < COD \leq 40$	Acceptable	Indication of contamination. Superficial water with self-purification capacity or biologically treated residual water discharge,
$40 < COD \leq 200$	Contaminaded	Superficial water with discharges of raw residual water, mainly of municipal origin.
$COD > 200$	Strongly contaminaded	Superficial water with strong impact of discharges of municipal and not municipal raw residual water.
Total Suspended Solids (TSS)		
$TSS \leq 25$	Excelent	Exception class, very good quality.
$25 < TSS \leq 75$	Good quality	Superficial water with low content of suspended solids, generally natural conditions. Advantages aquatics communities conservation and unrestricted agricultural irrigation.
$75 < TSS \leq 150$	Acceptable	Superficial water with indication of contamination. With discharges of biologically treated water. Regular condition for fishes. Restricted agricultural irrigation.
$150 < TSS \leq 400$	Contaminaded	Bad quality superficial water with raw residual water discharges. Water with high suspended material content.
$TSS > 400$	Strongly contaminaded	Superficial water with strong impact by municipal and not municipal raw residual water discharges with high quantity of contaminants. Bad condition for fishes.

Source: CONAGUA (2014). *Red de Monitoreo de Calidad del Agua*.

In the municipality of Rincón de Romos are extracted 23 millons of cubic meters of water per year, and according with the Water Quality Monitoring Network of CONAGUA, present a good and aceptable **BOD_5** in the same proportion of monitoring sites in 2011. That condition got better in the year of 2014, recording in all monitoring sites values in ranks of good quality in this criterion.

Sourcee: Banco de imágenes. CONABIO. http://bdi.conabio.gob.mx/fotoweb/Grid.fwx

Graphic 18. Superficial water quality. Municipal. 2011.

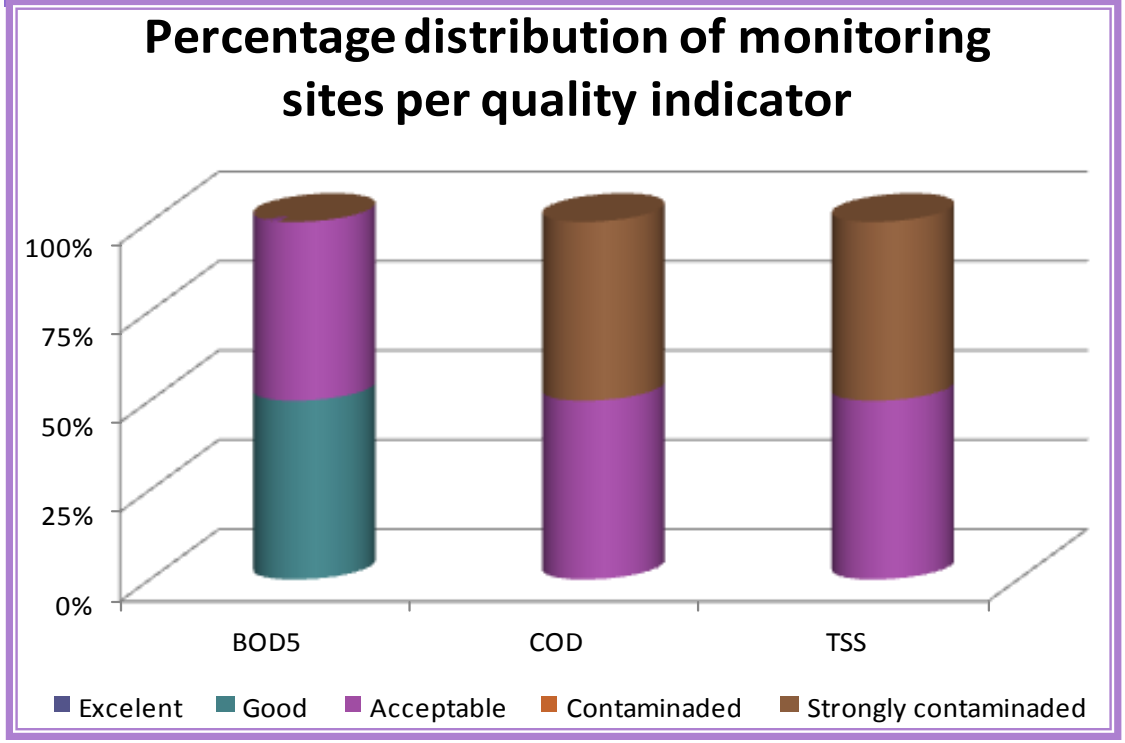


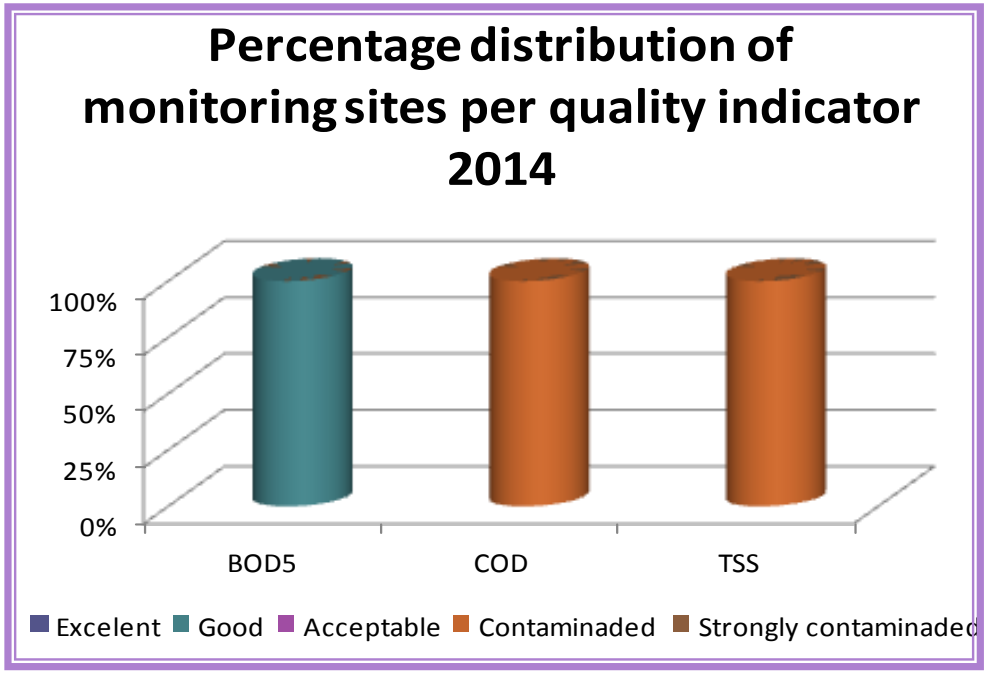
Table 18. Municipal table of superficial water condition 2011-2014.

Superficial water extraction and percentage distribution of monitoring sites by quality indicatior. Rincón de Romos.							
Achievements	**Extraction (m^3)**	**Indicators**	**Excelent**	**Good**	**Acceptable**	**Contaminaded**	**Strongly contaminaded**
2011							
130	23,064,896	**BOD_5**	0%	50%	50%	0%	0%
		COD	0%	0%	50%	0%	50%
		TSS	0%	0%	50%	0%	50%
2014							
130	23,064,896	**BOD_5**	0%	100%	0%	0%	0%
		COD	0%	0%	0%	100%	0%
		TSS	0%	0%	0%	100%	0%

In respect of Chemical Oxygen Demand (COD) and Total Suspended Solids (TSS), in the year of 2011 half of monitoring sites recordered aceptable ranks, and another half of the sited presented ranks of strong contamination; for the year of 2014 all monitoring sites recordered ranks inside strongly contaminated category for both indicators.

Source: http://bdi.conabio.gob.mx/fotoweb/Grid.fwx

Graphic 19. Superficial water quality. Municipal. 2014.



At state level superficial water condition was deteriorated from 2011 to 2014, being as percentage in the categories of contaminated and strongly contaminated for the three indicators (BOD, COD, TSS); furthermore percentage of monitoring sites with BOD_5 in categories of excelent and good decreased.

Source: http://vivaaguascalientes.com/presa-tunel-de-potrerillo/

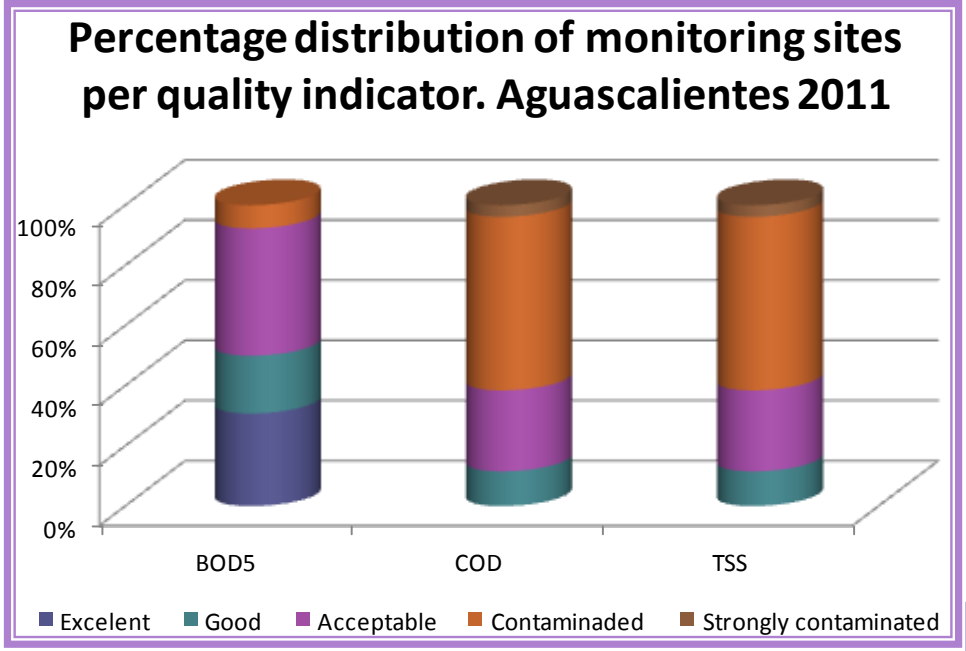
Table 19. State table of superficial water condition 2011-2014.

Superficial water extraction and percentage distribution of monitoring sites by quality indicators. Aguascalientes.							
Achievements	**Extraction (m^3)**	**Indicators**	**Excelent**	**Good**	**Acceptable**	**Contaminaded**	**Strongly contaminated**
2011							
130	23,064,896	**BOD_5**	30.77%	19.23%	42.31%	7.69%	0%
		COD	0%	11.54%	26.92%	57.69%	3.85%
		TSS	0%	11.54%	26.92%	57.69%	3.85%
2014							
130	23,064,896	**BOD_5**	2.94%	11.76%	70.59%	8.82%	5.88%
		COD	0%	0%	14.71%	73.53%	11.76%
		TSS	0%	0%	14.71%	73.53%	11.76%

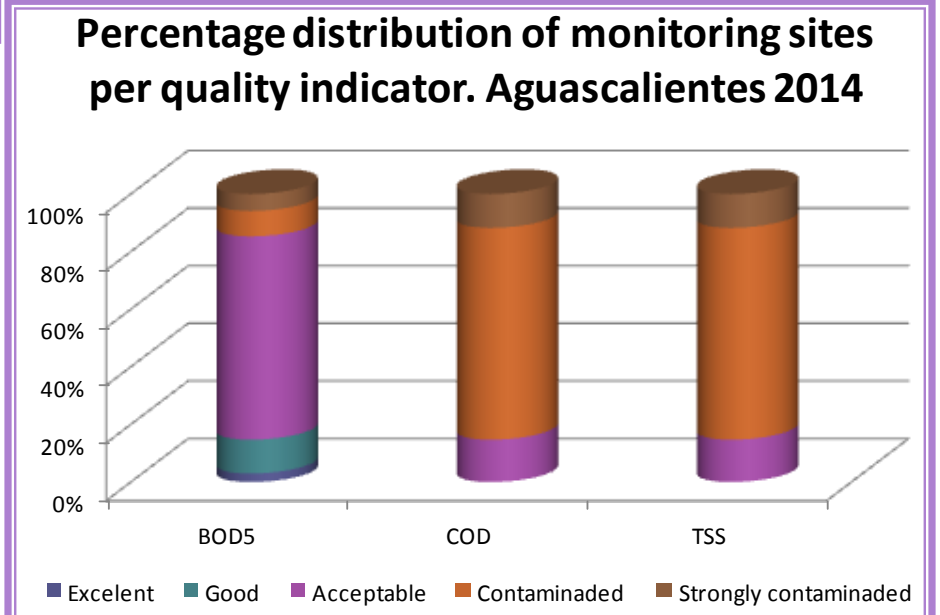
Source: CONAGUA (2014).

Source: http://bdi.conabio.gob.mx/fotoweb/Grid.fwx

Graphic 20. Superficial water.quality. State. 2011.



Graphic 21. Superficial water quality. State. 2014.



3.3.2 Underground water condition

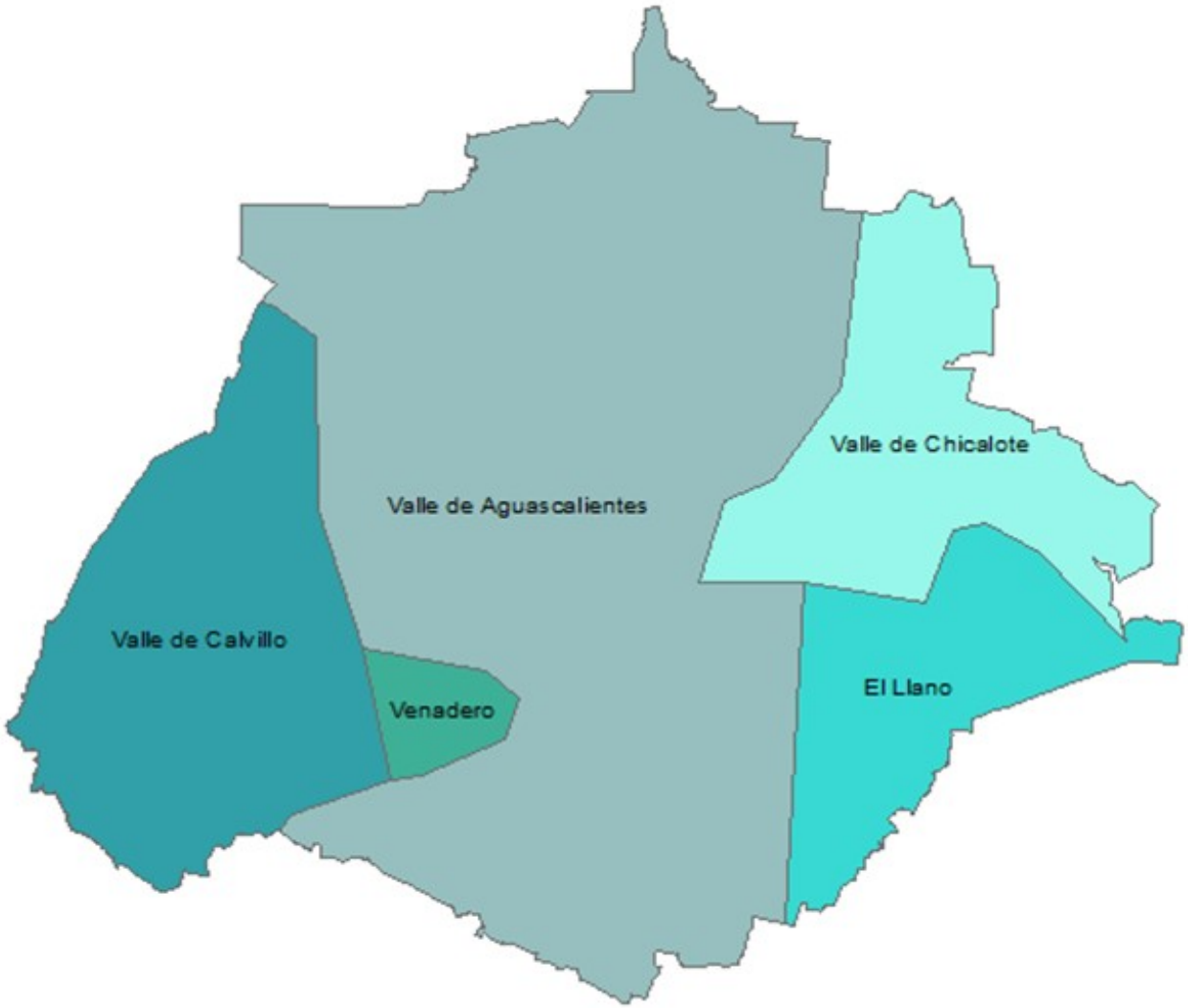
Underground water condition is not monitored with the same indicator of superficial water quality, due to there is only information of aquifers in terms of sub– or overexploited, according to aquifers recharge and extraction. Aguascalientes has five aquifers, all of them are free or not confinaded, that in accordance with their extraction and recharge present a geohydrologic condition of overexploited.

Table 20. Table of underground water condition 2014.

Underground water condition. Aguascalientes (2014)					
Aquifers	**Area (km^2)**	**Extraction (hm^3)**	**Recharge (hm^3)**	**Relation Extraction / Recharge**	**Geohydrologic condition**
Venadero	111	2	2	1.11	Overexploited
Valle de Chicalote	725	48	35	1.37	Overexploited
Valle de Calvillo	1,048	40	25	1.60	Overexploited
Valle de Aguascalientes	3,129	430	235	1.83	Overexploited
El Llano	555	24	15	1.60	Overexploited

Source: CONAGUA (2014).

Figure 5. Aquifers of Aguascalientes.

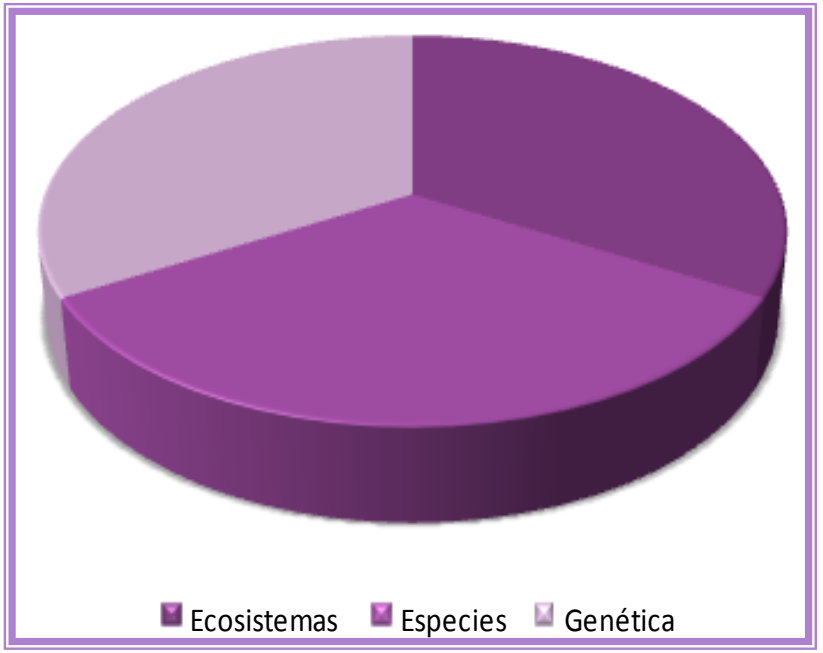


3.4 Biodiversity condition

Biodiversity refers to the variety of living beings (species) that can be found in a place. Biodiversity usually is reported in biological organization levels, such as diversity of species of plants, animals, fungus and microorganisms that live in a determinated place, and include genetic diversity levels and ecosystems.

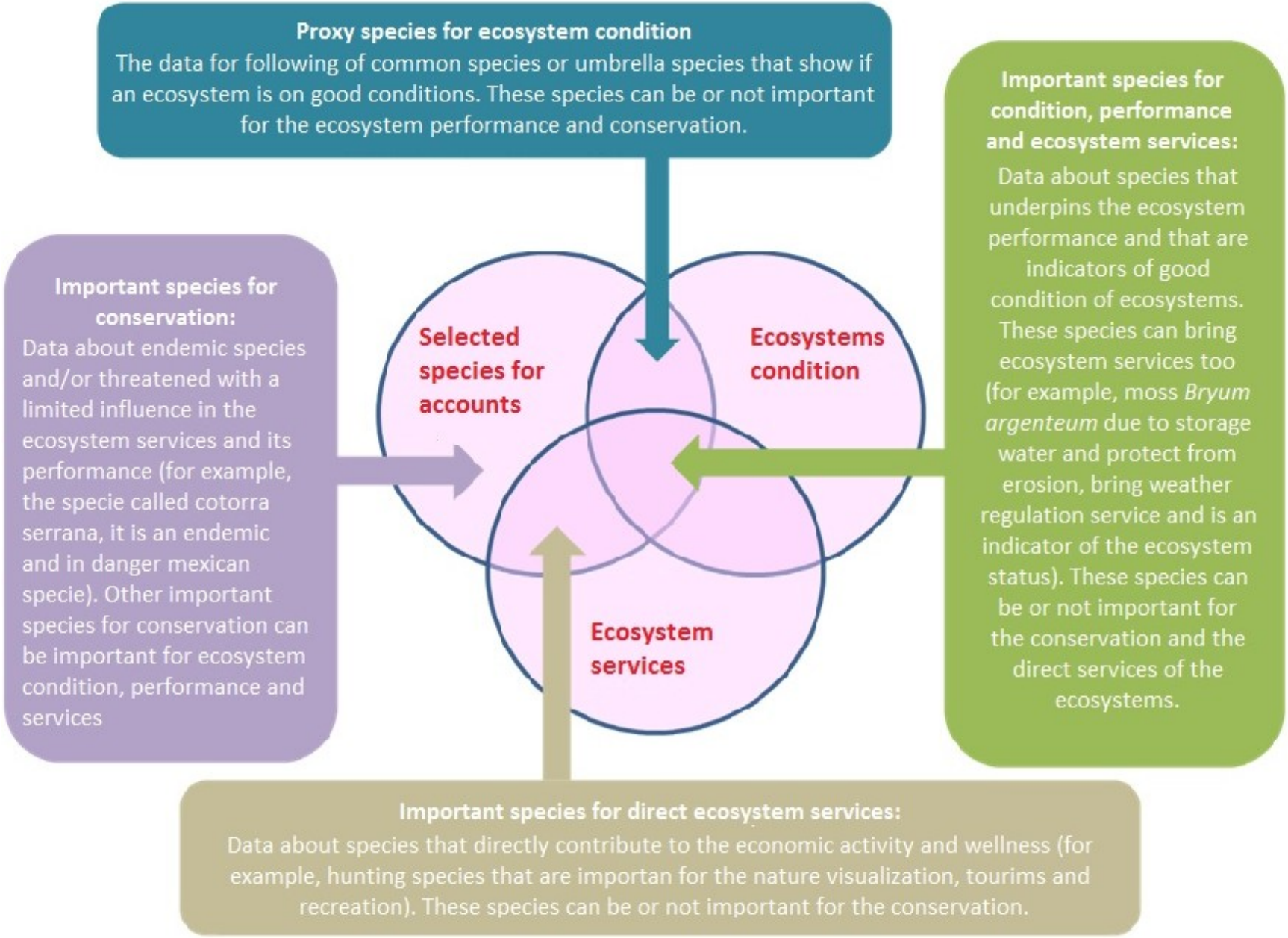
Source: http://bdi.conabio.gob.mx/fotoweb/Grid.fwx

Graphic 22. Biodiversity componets.



Genetic variety, species and ecosystems can be considered as determinant factors for the existance of less or more biodiversity. Relations carried up in an ecosystem can be specially primordial for number and variety of organisms that can be in an specific place and time, favoring or not presence of organisms.

Figure 6. Parcitipation of biodiversity in conservation services, condition and behavior of the ecosystem.



Biodiversity account is integrated by wealth and relative abundance of species, and tables of threatened species too. Features that imply being a megadiverse country hinder following from a period to another one, due to in the next tables are used products of alternative projects which recorder state's biodiversity in an specific time.

3.4.1 Wealth and relative abundance of species

Wealth is the number of species that are in an ecosystem and abundance corresponds to the number of individuals that conform the population of each species, The information for these tables was compiled from the Estudio de Biodiversidad de Aguascalientes published by CONABIO, in which is found wealth, relative abundance and distribution of mammals and birds, as well as wealth and abundance of reptiles.

That publication of biodiversity presents 78 species of mammals, from these species 37% are rare, 33% little common, 15% common and 14% abundant. These are located mainly in Valle de Aguascalientes (56%), Valle de Huejúcar (47%), Sierra Fría (37%), el Llano (33%) and Sierra de Tepezalá (30%).

Wealth is the number of species that are in an ecosystem and abundance corresponds to the number of individuals that conform the population of each species.

Graphic 23. State mammals distribution.

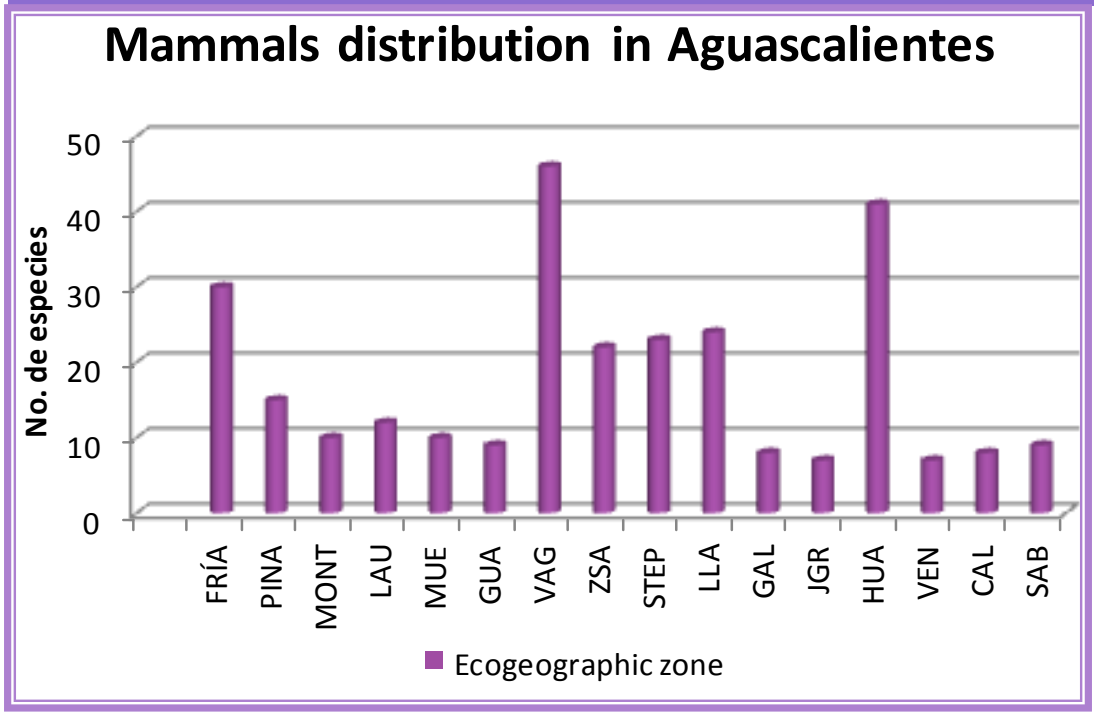
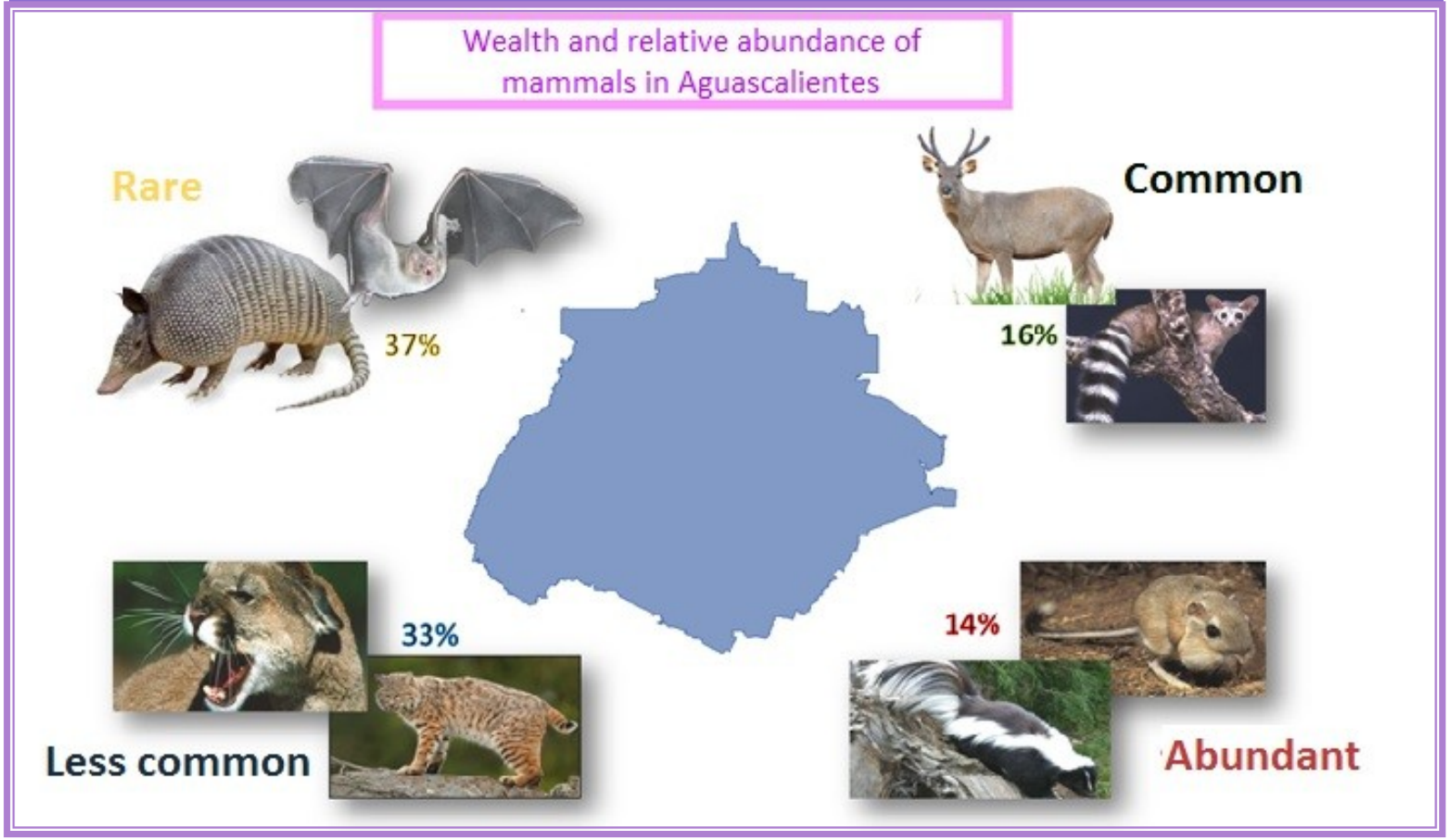


Table 21. Wealth and relative abundance of mammals of Aguascalientes (example)

Example of wealth, distribution and relative abundance of mammals in Aguascalientes								
Orden	Family	Scientific name	Common name	Relative abundance				Ecographic zone
				Rare	Less common	Common	Abundant	
Didelphimorphia	Didelphidae	Didelphis virginiana	Tlacuache o zarigüeya				X	ALL
Soricomorpha	Phyllostomidae	Choeronycteris mexicana	Musaraña	X				FRÍA
Soricomorpha	Soricidae	Notiosorex crawfordi	Musaraña	X				FRÍA
Cingulata	Dasypodidae	Dasypus novemcinctus	Armadillo	X				MUE, VAG, SAB
Chiroptera	Emballonuridae	Balantiopteryx plicata	Murciélago sacóptero		X			VAG
Chiroptera	Mormoopidae	Mormoops megalophylla	Murciélago bigotudo de cara plegada		X			HUA, CAL
Carnívora	Canidae	Urocyon cinereoargenteus	Zorra gris		X			FRÍA, PINA, VAG, HUA
Carnívora	Felidae	Lynx rufus	Gato montés		X			FRÍA, VAG, HUA, SAB
Artiodactyla	Cervidae	Odocoileus virginianus	Venado cola blanca			X		FRÍA, PINA, MONT, LAU, MUE, GUA, LLA, HUA, VEN, CAL
Rodentia	Sciuridae	Spermophilus mexicanus	Ardilla terrestre		X			GUA, STEP, HUA
Lagomorpha	Leporidae	Lepus californicus	Liebre de cola negra				X	ALL
Lagomorpha	Leporidae	Lepus callotis	Liebre de panza blanca		X			LLA

Source: CONABIO (comp.). 2016. *Catálogo de autoridades taxonómicas de los vertebrados con distribución en México. Base de datos SNIB-CONABIO*. México. Includes information from CS005, ES010 and CS003 projects.
CONABIO, Aguascalientes State Institute of Environment (IMAE), Autonomous University of Aguascalientes (UAA). México. 2008. La *Biodiversidad en Aguascalientes: Estudio de Estado*.
Abbreviations: FRÍA: Sierra fría, PINA: Sierra El Pinal, MONT: Mesa Montoro, LAU: Sierra del Laurel, MUE: Serranía El Muerto, GUA: Sierra de Guajolotes, VAG: Valle de Aguascalientes, ZSA: Zona Semiárida, STEP: Sierra de Tepezalá, LLA: El Llano, GAL: Serranía los Gallos, JGR: Cerro Juan El Grande, HUA: Valle de Huejúcar, VEN: Valle de Venadero, CAL: Presa Calles.

Figure 7. State relative abundance of mammals.



CONABIO has a project called aVerAves, in which data base has a total of 12,556 records of birds in the state of Aguascalientes during the period from may 14th 1987 to february 27th 2016. In those are reported 236,672 individuals from 285 species. According to the location where were reported, the observations were grouped for municipality.

Source: http://www.conabio.gob.mx/

Table 22. Wealth and distribution of birds in Aguascalientes (example)

WEALTH AND DISTRIBUTION OF BIRDS IN AGUASCALIENTES																	
Orden	**Family**	**Scientific name**	**Common name**	**Residence**	**NOM-059**	**Endemism**	**UICN**	**Vulnerability**	**Individuals observed by municipality**								
									Ag	**As**	**Ca**	**El**	**Je**	**Pa**	**Ri**	**Sa**	**Te**
Accipitriformes	Accipitridae	Accipiter cooperii	Gavilán de Cooper	MI,R	Pr	ne	LC	8	19	0	0	0	0	11	3	3	7
Accipitriformes	Accipitridae	Accipiter striatus	Gavilán Pecho Canela	MI,R	Pr	ne	LC	7	20	0	2	3	1	2	0	6	3
Anseriformes	Anatidae	Aix sponsa	Pato Arcoíris	MI	sc	ne	LC	8	1	0	0	0	0	0	0	2	0
Anseriformes	Anatidae	Anas acuta	Pato Golondrino	MI	sc	ne	LC	11	9	0	0	93	0	0	22	109	0
Apodiformes	Apodidae	Aeronautes saxatalis	Vencejo Pecho Blanco	R	sc	ne	LC	11	40	0	11	0	51	25	38	130	12
Apodiformes	Apodidae	Chaetura vauxi	Vencejo de Vaux	R,T	sc	ne	LC	11	0	0	0	0	0	1	0	0	0
Caprimulgiformes	Caprimulgidae	Antrostomus arizonae	Tapacaminos Cuerporruín Mexicano	R,MV	sc	ne	LC	14	0	0	0	0	0	2	0	0	0
Caprimulgiformes	Caprimulgidae	Antrostomus ridgwayi	Tapacaminos Tucuchillo	R,MV	sc	ne	LC	12	0	0	0	0	0	6	0	0	0
Cathartiformes	Cathartidae	Cathartes aura	Zopilote Aura	R	sc	ne	LC	5	275	0	51	25	75	156	88	391	102
Cathartiformes	Cathartidae	Coragyps atratus	Zopilote Común	R	sc	ne	LC	5	158	0	25	2	68	68	103	121	19
Charadriiformes	Charadriidae	Charadrius vociferus	Chorlo Tildío	R,MI	sc	ne	LC	9	218	0	0	57	23	5	0	60	29
Charadriiformes	Jacanidae	Jacana spinosa	Jacana Norteña	R	sc	ne	LC	11	0	0	0	0	0	0	0	0	0
Columbiformes	Columbidae	Columba livia	Paloma Doméstica	R	sc	Exo	LC	6	511	0	5	0	28	252	0	66	124
Columbiformes	Columbidae	Columbina inca	Tortolita Cola Larga	R	sc	ne	LC	8	1665	0	36	64	153	460	24	263	150

Continuation table 22. Wealth and distribution of birds in Aguascalientes (example)

WEALTH AND DISTRIBUTION OF BIRDS IN AGUASCALIENTES																		
Orden	**Family**	**Scientific name**	**Common name**	**Residence**	**NOM-059**	**Endemism**	**UICN**	**Vulnerability**	**Individuals observaded by municipality**									
Galliformes	Odontophoridae	Colinus virginianus	Codorniz Cotuí	R	sc	ne	NT	11	18	0	0	0	5	3	0	2	3	
Gruiformes	Rallidae	Fulica americana	Gallareta Americana	R,MI	sc	ne	LC	11	1131	20	23	21	87	67	2068	8101	2	
Gruiformes	Rallidae	Gallinula galeata	Gallineta Frente Roja	R,MI	sc	ne	LC	8	6	0	0	0	0	1	0	19	1	
Passeriformes	Alaudidae	Eremophila alpestris	Alondra Cornuda	R	sc	ne	LC	9	0	0	0	40	0	1	0	2	0	
Passeriformes	Bombycillidae	Bombycilla cedrorum	Chinito	MI	sc	ne	LC	6	36	0	0	0	0	166	0	0	10	
Pelecaniformes	Ardeidae	Ardea alba	Garza Blanca	MI,R	sc	ne	LC	7	329	1	8	5	79	45	48	177	5	
Pelecaniformes	Ardeidae	Ardea herodias	Garza Morena	MI,R	sc	ne	LC	7	13	0	2	3	8	4	4	28	0	
Piciformes	Picidae	Colaptes auratus	Carpintero de Pechera Común	R,MI	sc	ne	LC	10	63	0	18	3	12	7	0	38	3	
Piciformes	Picidae	Melanerpes aurifrons	Carpintero Cheje	R	sc	ne	LC	9	768	1	2	6	102	268	24	114	159	
Piciformes	Picidae	Melanerpes formicivorus	Carpintero Bellotero	R	sc	ne	LC	9	12	0	54	6	19	3	0	118	0	
Podicipediformes	Podicipedidae	Aechmophorus clarkii	Achichilique Pico Naranja	R,MI	sc	ne	LC	15	0	0	0	0	0	0	0	38	0	

Source: aVerAves/eBird. 2016. eBird: Base de datos en línea sobre distribución y abundancia de aves [aplicación web]. eBird/aVerAves, CONABIO, Cornell Lab of Ornithology, http://www.ebird.org

Nomenclature:

EN: Endemic; CE: Cuasiendemic; SE: Semiendemic; ne: Not endemic; Exo: Exotic.

R: Resident; MI: Winter migration; MV: Summer migration; T: Transient; A: Accidental; O: Oceanic.

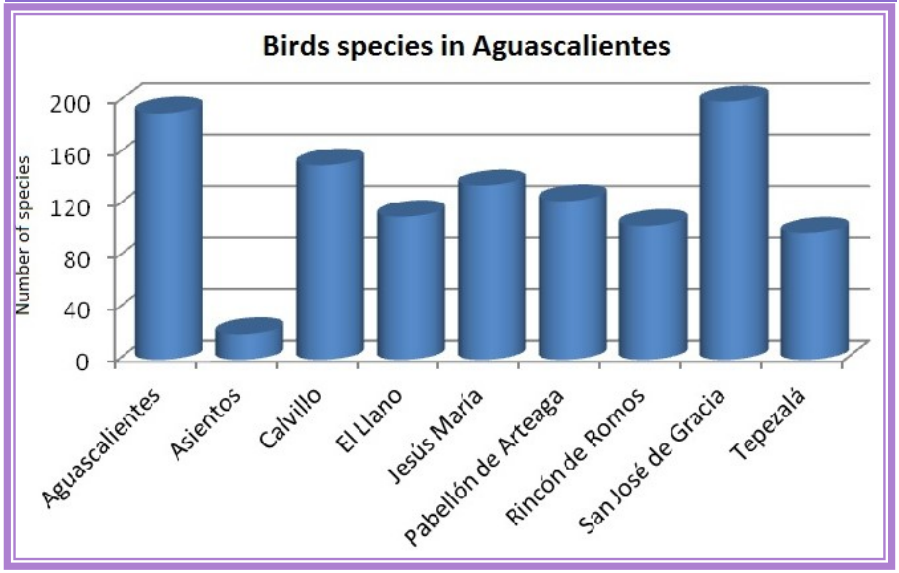
E: Probably extinct in wild; P: In extinction danger; A: Threatened; Pr: Holded in special protection; sc: without category.

EX: Extinct; EW: Extinct in nature; CR: Critical danger; EN: In danger; VU: Vulnerable; NT: Almost Threatened; LC: Minor preocupation; DD: Insufficient data; NE: Not assess; NR: Not recognized as specie by UICN.

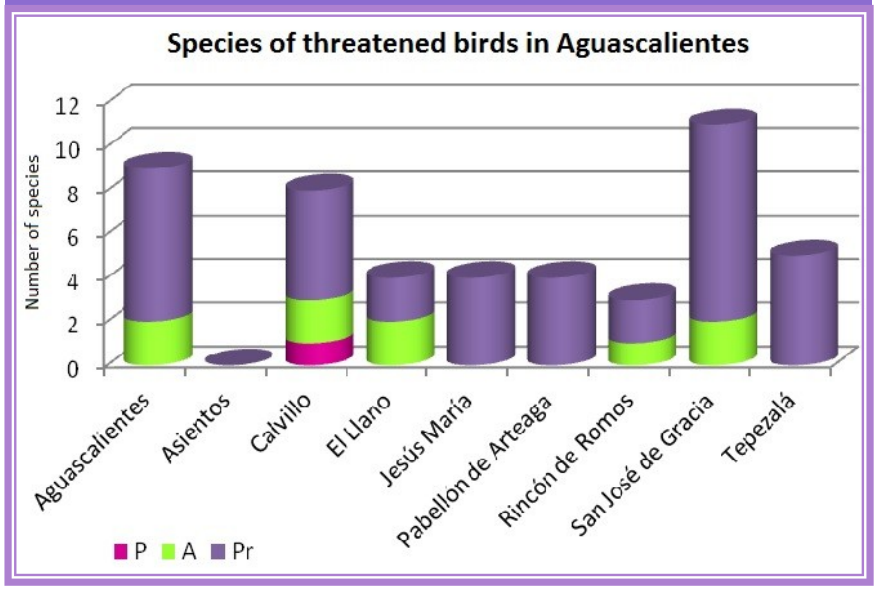
Ag: Aguascalientes; As: Asientos; Ca: Calvillo; El: El Llano; Je: Jesús María; Pa: Pabellón de Arteaga; Ri: Rincón de Romos; San José de Gracia; Te: Tepezalá.

Source: http://bdi.conabio.gob.mx/fotoweb/Grid.fwx

Graphic 24. Birds species in Aguascalientes by municipality.



Graphic 25. Threatened birds species in Aguascalientes by municipality.



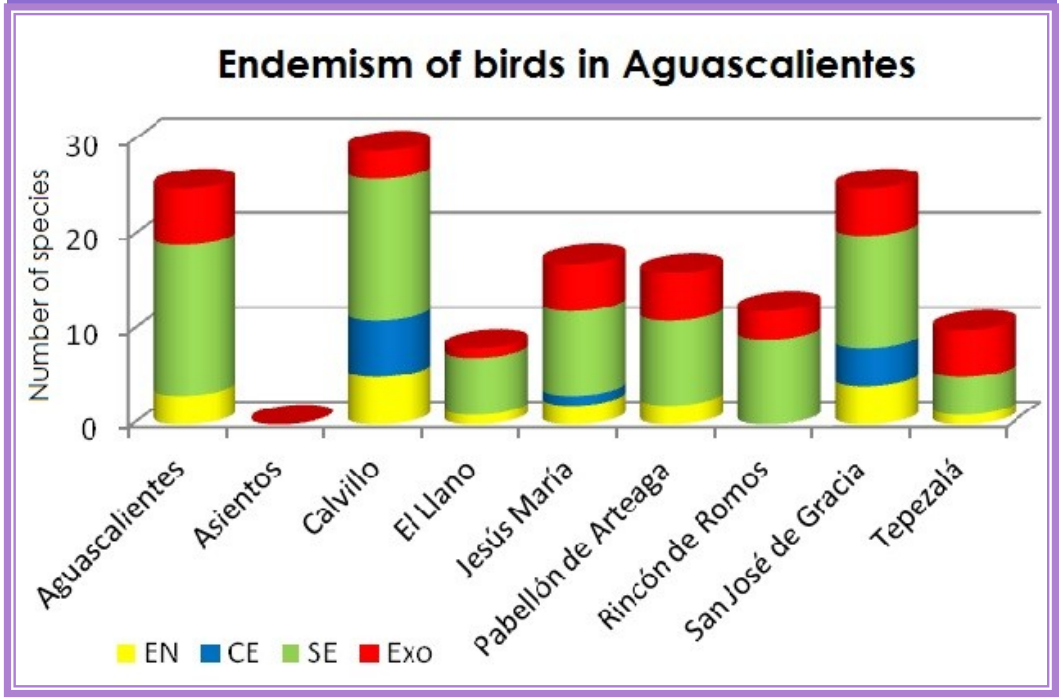
Source: http://bdi.conabio.gob.mx/fotoweb/Grid.fwx

The municipality with the biggest quantity of birds species is San José de Gracia (200 species), following by the municipality of Aguascalientes (191 species).

From the reportated species in Aguascalientes and that are inside the Official Mexican Norm NOM-059-SEMARNAT-2010, one is in danger of extinction (reported in the municipality of Calvillo), 9 are in category of threatened (reported in the municipalities of Aguascalientes, Calvillo, El Llano, Rincón de Romos and San José de Gracia), and 38 are holded to special protection (reported in the municipalities of Aguascalientes, Asientos, Calvillo, El Llano, Jesús María, Pabellón de Arteaga, Rincón de Romos, San José de Gracia and Tepezalá).

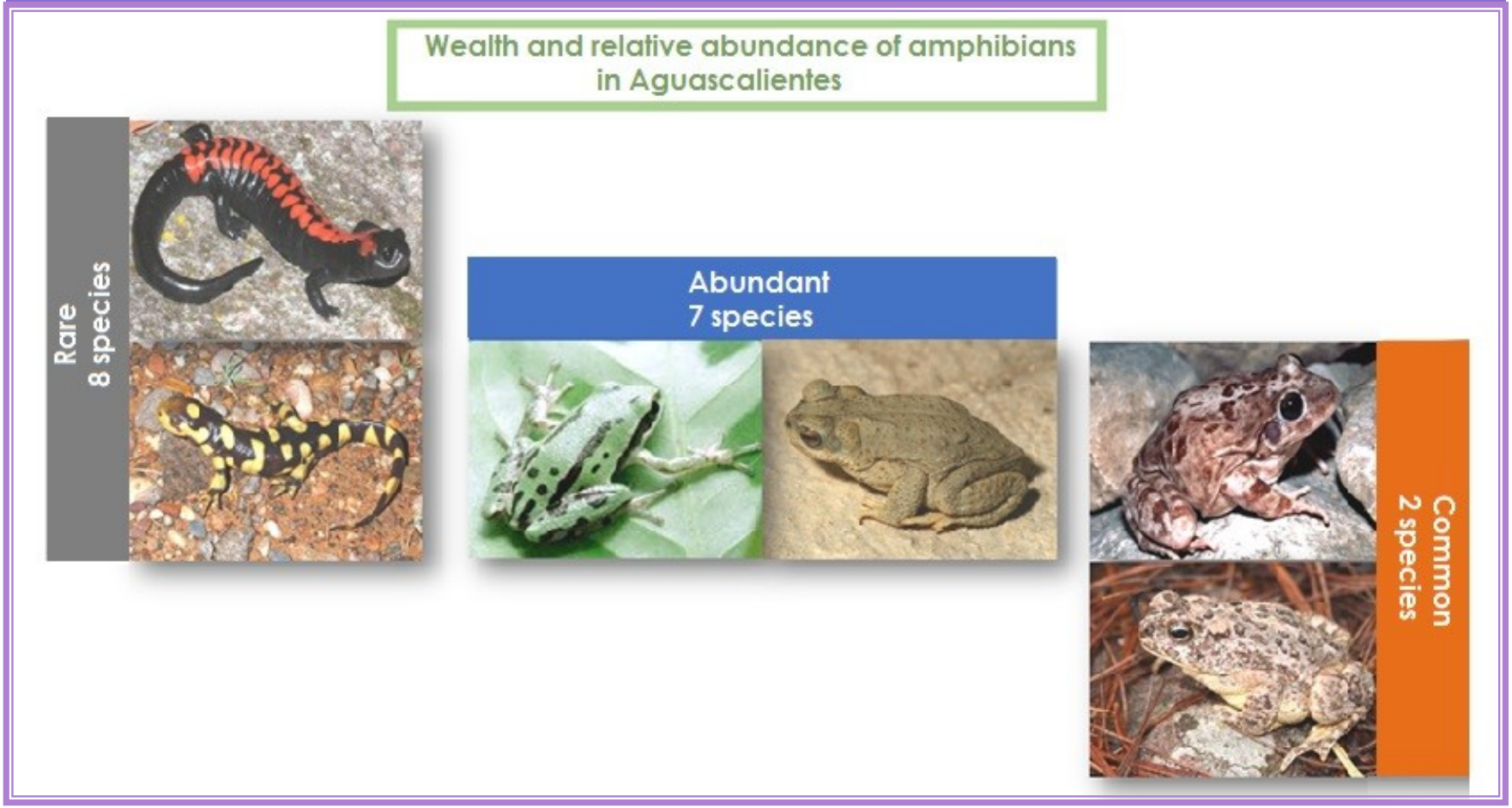
The biggest quantity of endemic species and cuasiendemics was reported in Calvillo (5 y 6 species respectively), whilst in the municipality of Aguascalientes were reported the highest number of semiendemics species (16 species) and exotics (6 species).

Graphic 26. Endemism of birds in Aguascalientes by municipality.



Source: http://bdi.conabio.gob.mx/fotoweb/Grid.fwx

Figure 8. Wealth and relative abundance of amphibians in Aguascalientes.



Source: http://www.conabio.gob.mx/

In the state of Aguascalientes are recordered 17 species of amphibians, from these eight are rare, two are commons and the rest is considered as abundant species. These species are mentioned in the table of the next page, indicating their corresponding classification of relative abundance.

Source: http://www.conabio.gob.mx/

Source: CONABIO (comp.). 2016. *Catálogo de autoridades taxonómicas de los vertebrados con distribución en México. Base de datos SNIB-CONABIO*. México. Includes information from CS005, ES010 and CS003 projects.
CONABIO, Aguascalientes State Institute of Environment (IMAE), Autonomous University Aguascalientes (UAA). México. 2008. La *Biodiversidad en Aguascalientes: Estudio de Estado*.

Table 23. Wealth and relative abundance of amphibians in Aguascalientes.

Wealth and relative abundance of amphibians in Aguascalientes			
Orden	**Family**	**Scientific name**	**Abundance**
Anura	Bufonidae	Anaxyrus cognatus	Rare
Anura	Bufonidae	Anaxyrus compactilis	Abundant
Anura	Bufonidae	Anaxyrus punctatus	Abundant
Anura	Bufonidae	Incilius occidentalis	Common
Anura	Hylidae	Dryophytes arenicolor	Abundant
Anura	Craugastoridae	Craugastor augusti	Abundant
Anura	Hylidae	Smilisca dentata	Rare
Anura	Craugastoridae	Craugastor augusti	Common
Anura	Eleutherodactylidae	Eleutherodactylus nitidus	Rare
Anura	Microhylidae	Hypopachus variolosus	Abundant
Anura	Scaphiopodidae	Spea multiplicata	Abundant
Anura	Ranidae	Lithobates catesbeianus	Rare
Anura	Ranidae	Lithobates montezumae	Abundant
Anura	Ranidae	Lithobates neovolcanicus	Rare
Anura	Ranidae	Lithobates psilonota	Rare
Caudata	Ambystomatidae	Ambystoma tigrinum	Rare
Caudata	Plethodontidae	Isthmura bellii	Rare

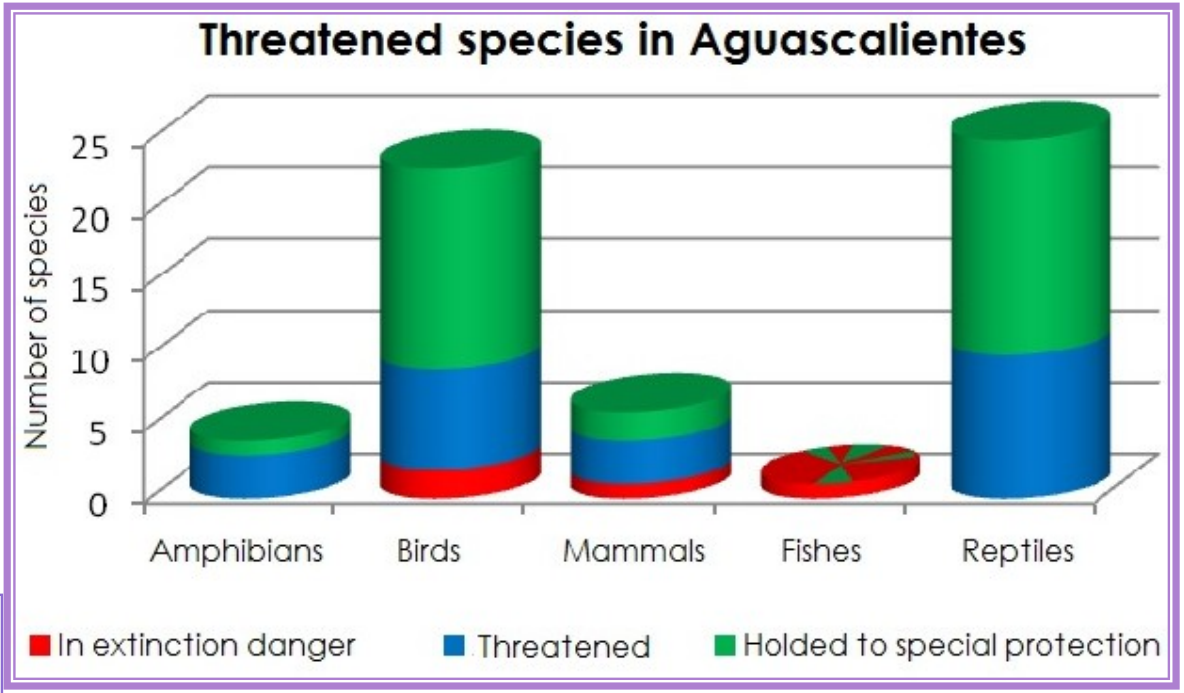
3.4.2 Threatened species

The table of threatened species is based in information from the Official Mexican Norm NOM-059-SEMARNAT-2010. That table use NOM's classification to present the condition of threat in which species are.

The catalog of taxonomic authorities of vertebrates with distribution in Mexico from the database SNIB-CONABIO presents a list of 59 species inside NOM-059-SEMARNAT-2010: 4 species of amphibians, 23 of birds, 6 of mammals, and 25 of reptiles.

Source: http://bdi.conabio.gob.mx/fotoweb/Grid.fwx

Graphic 27. Threatened species in Aguascalientes.



From those species, 32 are holded to special protection, 23 threatened and 4 in danger of extinction.

In the graphic number 27 is the distribution of the threatened species and its category according with the normativity mentioned before.

Table 25. Threatened species in Aguascalientes (example)

Threatened species in Aguascalientes				
Group	**Orden**	**Familiy**	**Scientific name**	**Category NOM-059-SEMARNAT- 2010**
Amphibia	Anura	Hylidae	Smilisca dentata	Threatened (A)
Amphibia	Anura	Ranidae	Lithobates montezumae	Holded to special protection (Pr)
Amphibia	Anura	Ranidae	Lithobates neovolcanicus	Threatened (A)
Birds	Accipitriformes	Accipitridae	Accipiter cooperii	Holded to special protection (Pr)
Birds	Accipitriformes	Accipitridae	Accipiter striatus	Holded to special protection (Pr)
Birds	Accipitriformes	Accipitridae	Buteo albonotatus	Holded to special protection (Pr)
Mammalia	Rodentia	Erethizontidae	Erethizon dorsatum	Extinction danger (P)
Mammalia	Chiroptera	Phyllostomidae	Choeronycteris mexicana	Threatened (A)
Mammalia	Rodentia	Cricetidae	Nelsonia neotomodon	Holded to special protection (Pr)
Fishes	Cyprinodontiformes	Goodeidae	Allotoca dugesii	Extinction danger (P)
Reptilia	Squamata	Anguidae	Elgaria kingii	Holded to special protection (Pr)
Reptilia	Squamata	Anguidae	Gerrhonotus liocephalus	Holded to special protection (Pr)
Reptilia	Squamata	Phrynosomatidae	Phrynosoma orbiculare	Threatened (A)

Source: CONABIO (comp.). 2016. Catálogo de autoridades taxonómicas de los vertebrados con distribución en México. Base de datos SNIB-CONABIO. México. Incluye información de los proyectos CS005, ES010 y CS003

4. ECOSYSTEM SERVICES SUPPLY AND USE ACCOUNT

Source: http://vivaaguascalientes.com/sierra-del-laurel/

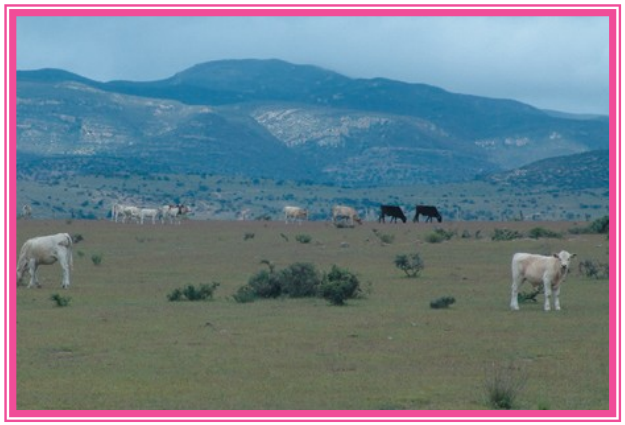
4. ECOSYSTEM SERVICES SUPPLY AND USE ACCOUNT

Ecosystem services supply and use account presents the services of every component of ecosystems in physical and units and hybrids tables.

4.1 Soil

Services supply and use tables of land component include information of crops and cattle provision at municipal and state level.

There is not georeferenced information about crops, but offer is adjudicated to Land Cover Ecosystem Units (LCEU), of lands of temporal and irrigated crops, such as permanent crops.



Source: La biodiversidad en Aguascalientes. Estudio de Estado. CONABIO.

4.1.1 Crops

From the 2,477 km^2 of extent of LCEUs, corresponding to crops in the state of Aguascalientes in 2011, the surface sown occupied 1,228 km^2, whilst harvested corresponded to 1,382 km^2. The municipalities with the highest production are Aguascalientes, Asientos and El Llano. The tables of supply and use agricultural at municipal level recorder the surface sown and harvested , tonnage of production and yield per every crop.

Main crops in the municipality of El Llano are green alfalfa and forage corn, which in 2011 corresponded to the 41.76% and 32.64% of the production respectively, and in the year of 2014 accounted for 18.99% and the 66.79% respectively. For those, there was a yield in 2011 of 97 and 59 tonnes per hectare respectively, and in 2014 were of 87.81 and 31.86 tonnes per hectare respectively. Other crops of forage have a big production in the state too.

70

Table 26. Agricultural production in Aguascalientes per municipality 2011-2014. Physical units.

Agricultural production in Aguascalientes.				
Municipality	**2011**		**2014**	
	Sown surface (Ha)	**Harvested surface (Ha)**	**Sown surface (Ha)**	**Harvested surface (Ha)**
Aguascalientes	31,050.00	10,631.00	31,628.00	30,050.00
Asientos	14,250.00	7,613.00	19,264.00	19,222.00
Calvillo	10,602.00	7,414.00	10,812.70	9,958.70
Cosío	4,032.00	3,449.00	6,528.00	6,151.00
El Llano	22,286.00	1,957.00	23,207.00	23,113.00
Jesús María	9,327.00	4,927.00	11,982.00	11,551.00
Pabellón de Arteaga	5,152.00	4,442.00	8,574.00	7,885.00
Rincón de Romos	10,684.00	9,303.00	14,083.00	14,073.00
San Francisco de Los Romo	6,195.00	2,601.00	6,656.00	6,475.00
San José de Gracia	1,201.00	523	3,757.00	3757
Tepezalá	8,033.00	5,467.00	10,135.00	6,005.00
Total	**122,812.00**	**58,327.00**	**146,626.70**	**138,240.70**

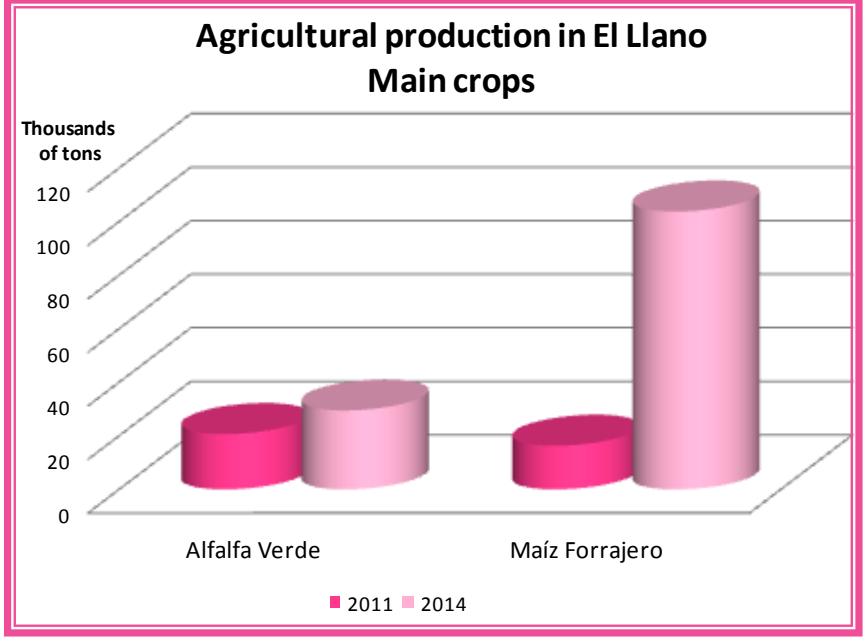
Source: SAGARPA, *Servicio de Información Agroalimentaria y Pesquera*.

Table 27. Supply and use of agricultural land in the municipality of El Llano 2011-2014. Physical units.

Agricultural production in the munipality of El Llano								
Crop	2011				2014			
	Sown surface (Ha)	Harvest surface (Ha)	Production (Ton)	Yield (Ton/Ha)	Sown surface (Ha)	Harvest surface (Ha)	Production (Ton)	Yield (Ton/Ha)
Agave	93	25	175	7	NA	NA	NA	NA
Alfalfa Verde	213	213	20661	97	336	336	29504	87.81
Avena Forrajera	673	143	3319	23.21	200	200	4956	24.78
Cebolla	4	4	80	20	NA	NA	NA	NA
Chile Verde	36	36	510	14.17	1	1	7.85	7.85
Frijol	3,145	30	63	2.10	2,436	2,421	925.29	0.38
Maíz Forrajero	9,597	277	16,305	58.86	10,427	10,427	103,787	9.95
Maíz Grano	7,302	208	1,414.40	6.80	8,775	8,745	6,696.07	0.77
Manzana	5	5	27	5.4	2	2	12.4	6.2
Nopal Forrajero	93	89	2225	25	88	88	2804	31.86
Nuez	2	2	2.7	1.35	2	2	3.2	1.6
Pastos	964	769	4220.4	5.49	761	716	5376	7.51
Tomate Verde	5	5	95	19	NA	NA	NA	NA
Tuna	58	58	104.4	1.8	32	32	102	3.19
Uva	96	93	751.44	8.08	91	87	1226	14.09
Total	**22,286**	**1,957**	**49,953.34**	**25.53**	**23,151**	**23,057**	**155,399.81**	**6.74**

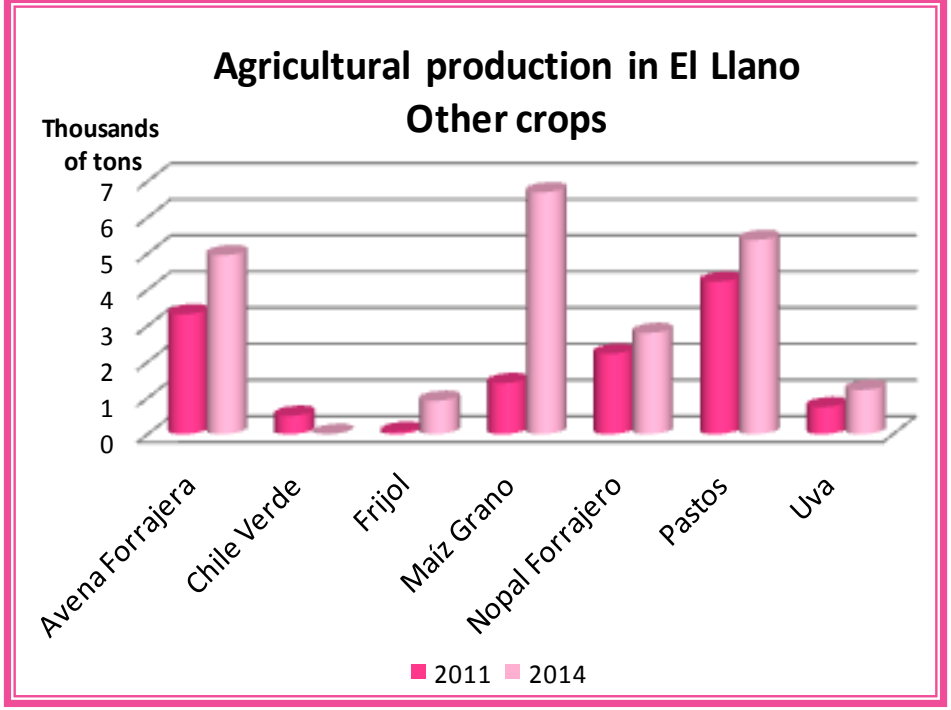
Source: SAGARPA,

Graphic 28. Municipal production of main agricultural crops 2011-2014.



In this page there are two graphics, the first one corresponds to main agricultural crops. Furthermore, is shown another one with the rest of the crops in the period of 2011-2014 for the municipality of El Llano. This division was made to appreciate the values better, because of the big difference between the quantities produced.

Graphic 29. Municipal production of other agricultural crops 2011-2014.



For this project, there were used hybrib tables too, which let us know agricultural production in El Llano in physical and monetary units. For example, that in the year of 2011 were obtained on average 23 thousand pesos per hectare, in 2014 yield was descreased to 5 thousand pesos per hectare.

Table 28. Hybrid table of supply and use of agricultural land at municipal level. 2011.

Hybrid table of agricultural production in the municipality of El Llano. 2011.							
Product	Sown surface (Ha)	Harvest surface (Ha)	Production (Ton)	Yield (Ton/Ha)	Production (Thousands of pesos)	Intermediate consumption (Thousands of pesos)	Gross value added (Thousands of pesos)
Agave	93	25	175	7	754	275	479
Alfalfa Verde	213	213	20,661	97	16,546	6,036	10,510
Avena Forrajera	673	143	3,319	23	1,267	462	805
Cebolla	4	4	80	20	259	94	164
Chile Verde	36	36	510	14	3,291	1,201	2,090
Frijol	3,145	30	63	2	855	312	543
Maíz Forrajero	9,597	277	16,305	59	10,169	3,710	6,459
Maíz Grano	7,302	208	1,414	7	4,602	1,679	2,923
Manzana	5	5	27	5	160	58	102
Nopal Forrajero	93	89	2,225	25	480	175	305
Nuez	2	2	3	1	102	37	65
Pastos	964	769	4,220	5	1,294	472	822
Tomate Verde	5	5	95	19	512	187	325
Tuna	58	58	104	2	225	82	143
Uva	96	93	751	8	4,859	1,773	3,086
Total	**22,286**	**1,957**	**49,953**	26	**45,375**	**16,554**	**28,822**

Table 29. Hybrid Table of supply and use of agricultural land at municipal level 2014.

Hybrid table of agricultural production in the municipality of El Llano. 2014.							
Product	Sown surface (Ha)	Harvest surface (Ha)	Production (Ton)	Yield (Ton/Ha)	Production (Thousands of pesos)	Intermediate consumption (Thousands of pesos)	Gross value added (Thousands of pesos)
Agave					0	0	0
Alfalfa Verde	336	336	29,504	88	19,172	7,132	12,040
Avena Forrajera	200	200	4,956	25	2,337	870	1,468
Cebolla					0	0	0
Chile Verde	1	1	8	8	49	18	31
Frijol	2,436	2,421	925	0	4,969	1,849	3,120
Maiz Forrajero	10,427	10,427	103,787	10	62,430	23,225	39,205
Maiz Grano	8,775	8,745	6,696	1	19,197	7,142	12,056
Manzana	2	2	12	6	48	18	30
Nopal Forrajero	88	88	2,804	32	1,002	373	629
Nuez	2	2	3	2	104	39	66
Pastos	761	716	5,376	8	2,593	965	1,629
Tomate Verde					0	0	0
Tuna	32	32	102	3	296	110	186
Uva	91	87	1,226	14	4,766	1,773	2,993
Total	**23,151**	**23,057**	**155,400**	**7**	**116,963**	**43,511**	**73,451**

At state level main crops are forage corn and green alfalfa. In 2011, crop of forage corn was the 43.66% of the production in Aguascalientes, with a yield of 51.75 tonnes per hectare; whislt green alfalfa was the 26.15% of the total production, with a yield of 92.91 tonnes per hectare.

In 2014, the participation of forage corn in the total production increase, corresponding to the 51.52% from the total; nevertheless, the yield decreased to 21.72 tonnes per hectare; whilst green alfalfa represents the 20.55% from total production, with a yield of 89.67 tonnes per hectare. Others crops of big production are pastures and forage oats.

Source: http://www.sagarpa.gob.mx

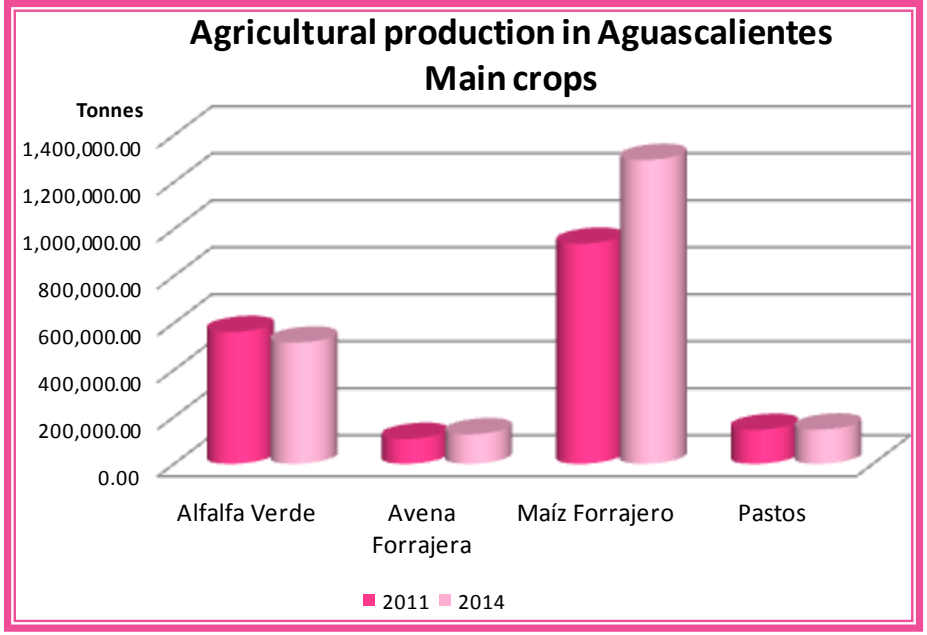
Table 30. State production of main agricultural crops 2011-2014.

Agricultural production in the state of Aguascalientes								
Crop	2011				2014			
	Sown surface (Ha)	Harvest surface (Ha)	Production (Ton)	Yield (Ton/Ha)	Sown surface (Ha)	Harvest surface (Ha)	Production (Ton)	Yield (Ton/Ha)
Aceituna	1	0	0	NA	1	1	4	4
Acelga	18	18	171	9.5	23	23	209.1	9.09
Agave	525	25	175	7	71	0	0	NA
Aguacate	17	17	191.4	11.26	19	17	185.8	10.93
Ajo	286	286	3874	13.55	213	213	2859.8	13.43
Alfalfa Verde	6,045	6,042	561,388.73	92.91	5,756	5,756	516,131.55	89.67
Avena Forrajera	5,642	4,097	105,938.10	25.86	5,471	5,456	125,636.30	23.03
Betabel	4	4	62	15.5	6	6	91.5	15.25
Brócoli	506	506	8434	16.67	581	581	9503.5	16.36
Cacahuate	16	10	35	3.5	15	15	32.4	2.16
Calabacita	178	170	4674	27.49	150	150	4027.5	26.85
Calabaza	4	0	0	NA	NA	NA	NA	NA
Camote	14	14	254	18.14	10	7	154	22
Cebada Forrajera					38	38	1064	28
Cebolla	189	189	4420.5	23.39	215	215	7103	33.04
Chía	NA	NA	NA	NA	20	0	0	NA
Chícharo	41	41	264	6.44	31	31	207.39	6.69
Chile Verde	868	868	14335.5	16.52	905	875	12076.35	13.8
Cilantro	141	141	2674.5	18.97	146	146	2101.2	14.39
Col (repollo)	187	187	7668	41.01	242	242	9920.1	40.99
Coliflor	284	284	7419	26.12	216	216	4718	21.84
Durazno	383	357	5634.5	15.78	400	275	4403.55	16.01
Ejote	86	86	1077	12.52	64	64	887.5	13.87
Elote	732	732	17497	23.9	1,083	1,083	25,484	23.53
Espinaca	20	20	382	19.1	53	53	971.3	18.33
Fresa	6	6	90	15	25	25	1235.5	49.42
Frijol	5,785	1,207	2,215	1.84	8,906	8,494	5,399.75	0.64
Granada	2	2	8	4	NA	NA	NA	NA

Agricultural production in the state of Aguascalientes								
Crop	2011				2014			
	Sown surface (Ha)	Harvest surface (Ha)	Production (Ton)	Yield (Ton/Ha)	Sown surface (Ha)	Harvest surface (Ha)	Production (Ton)	Yield (Ton/Ha)
Guayaba	6,414	6,273	94,661.32	15.09	6,268.20	6,187.20	98,189.20	15.87
Lechuga	1,151	1,151	38,495	33.44	1,405	1,405	54,535.40	38.82
Lima	21	17	119	7	19	17	122	7.18
Limón	4	4	46	11.5	6	4	48	12
Maguey Pulquero (Thousands of liters)	5	0	0	NA	NA	NA	NA	NA
Maíz Forrajero	48,218.50	18,112.00	937,288.40	51.75	61,150.00	59,571.00	1,293,770.02	21.72
Maíz Grano	32,156.00	6,685.00	51,246.50	7.67	39,980.00	34,283.00	64,271.21	1.87
Manzana	50	50	315	6.3	48	48	611.2	12.73
Membrillo	8	8	44	5.5	8	8	40.8	5.1
Naranja	2	2	14	7	2	2	14.4	7.2
Nopal Forrajero	1,075	903	27,488.50	30.44	1,067.50	977.50	34,044.25	34.83
Nopalitos	204	195	8005.3	41.05	199	199	9617.3	48.33
Nuez	232	177	377.98	2.14	224	163	310.9	1.91
Papa	8	8	260	32.5	NA	NA	NA	NA
Pastos	6,152	5,377	144,694.94	26.91	5,303	5,240	145,877.60	27.84
Pepino	125	119	4094	34.4	140	140	5812	41.51
Persimonio	1	1	8	8	1	1	8	8
Rábano	11	11	74.6	6.78	12	11	72.3	6.57
Sorgo Forrajero	1,094.50	214.00	10,502.50	49.08	1,175	1,075	24,492.52	22.78
Sorgo Grano	35	35	245	7	7	7	56	8
Tomate Rojo (jitomate)	397	391	13288	33.98	502	502	15789.76	31.45
Tomate Verde	416	416	9742	23.42	591	591	13394.5	22.66
Triticale Forrajero	1,287.00	1,279.00	42,443.60	33.18	NA	NA	NA	NA
Tuna	787	660	1641.9	2.49	647	647	2178.45	3.37
Uva	846	800	10161.44	12.7	779	747	9868	13.21
Zanahoria	132	130	2630	20.23	146	146	3480.2	23.84
Total	**122,812**	**58,327**	**2,146,769.21**	**36.81**	**144,344.7**	**135,958.7**	**2,511,181.1**	**18.47**

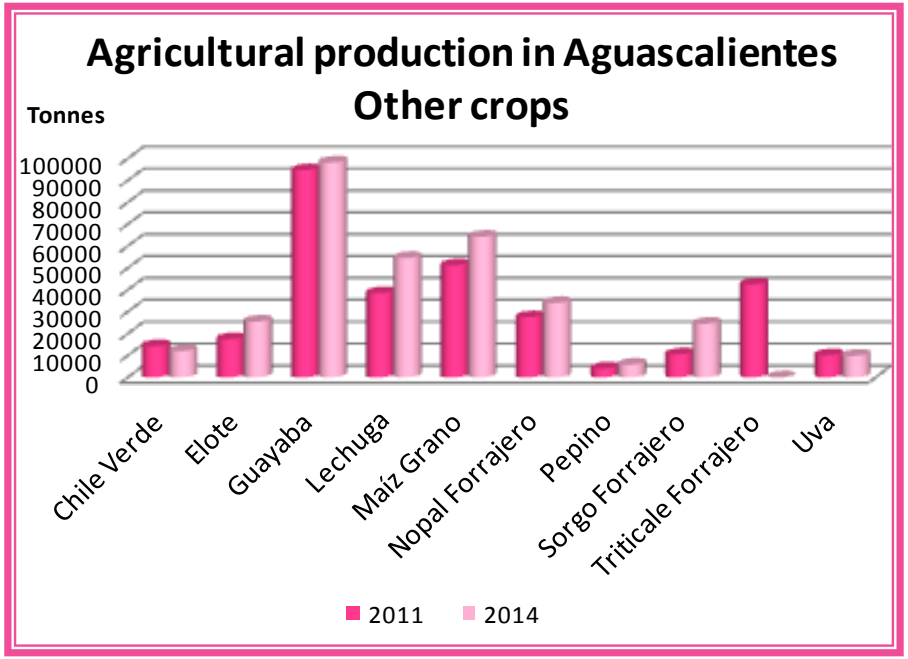
Source: SAGARPA, *Servicio de Información Agroalimentaria y Pesquera*.

Graphic 29. State production of main agricultural crops 2011-2014.



The hybrid tables of agricultural production in Aguascalientes let us compare the sown and harvest surface for the production of every crop (tonnes) with the production monetary value and gross added value. While in 2011 were generated on average 38, 512 pesos per hectare, in 2014 the yield decreased to 18,328 pesos per hectare.

Graphic 30. State production of others agricultural crops 2011-2014.

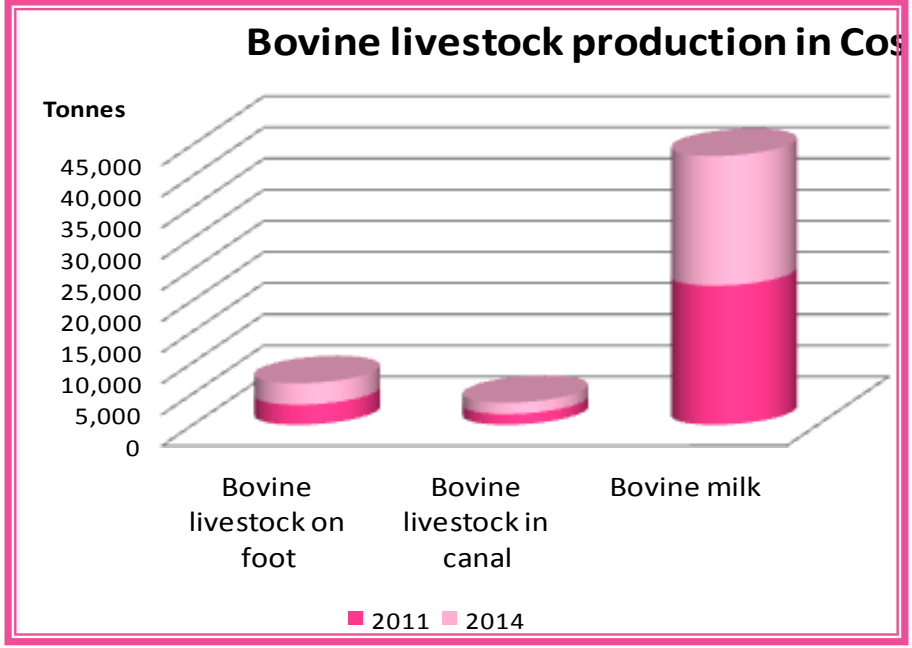


4.1.2 Livestock farming

Tables of supply and use of livestock farming content the offer of livestock on foot, meat in canal and other pecuary products in each municipality on two countable years (2011 and 2014). The lack of georeferenciaded information about farms of production limits the analysis at municipal level, but as this information comes up it could be possible to deploy the information al LCEUs level.

In the municipality of Cosío main livestock production is of bovine type, with a production of 3,222.75 tonnes in foot, 1,712 tonnes in canal and 22,342.28 thousands of milk liters in 2011; and 3,434.91 tonnes in foot, 1,845 tonnes in canal and 20,843.22 thousands of milk liters during 2014. Another livestock production includes ovine and goat livestock, in canal and on foot, such as honey.

Graphic 31. Main livestock production at municipal level 2011-2014.



Graphic 32. Another pecuary production at municipal level 2011-2014.

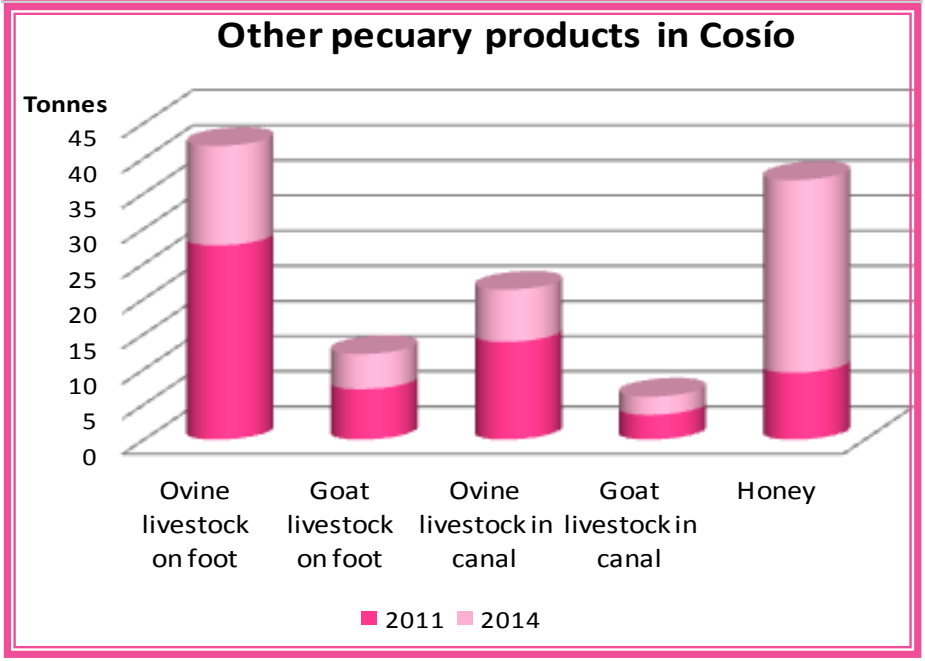


Table 31. Table of supply and use of land for livestock at municipal level 2011-2014.

Production, price, value, sacrificed animals and weight. Cosío						
Product/specie	2011			2014		
	Production (tonnes)	Sacrificed animals (heads)	Weight (kilograms)	Production (tonnes)	Sacrificed animals (heads)	Weight (kilograms)
Livestock on foot						
Bovine	3,222.75		400.64	3,434.91		437.85
Ovine	27.61		43.76	14.15		43.28
Goat	7.16		37.67	5.01		38.55
Subtotal	**3,258**			**3,454.07**		
Meat in canal						
Bovine	1,712.00	8,044	212.83	1,827.82	7,845	232.99
Ovine	13.88	631	22	7.43	327	22.72
Goat	3.5	190	18.42	2.6	130	20
Subtotal	**1,729**			**1,837.85**		
Milk						
Bovine	22,342.28			20,843.22		
Caprine						
Subtotal	**22,342**			**20,843.22**		
Other products						
Honey	9.5			27.402		
Wax						
Dirty wool						
Subtotal	**9.5**			**27.402**		
Total	**27,339**			**26,162.54**		

Source: SAGARPA, *Servicio de Información Agroalimentaria y Pesquera*.
Note: Milk production is expresed in thousands of liters. Subtotals and totals might not coincide by rounding.

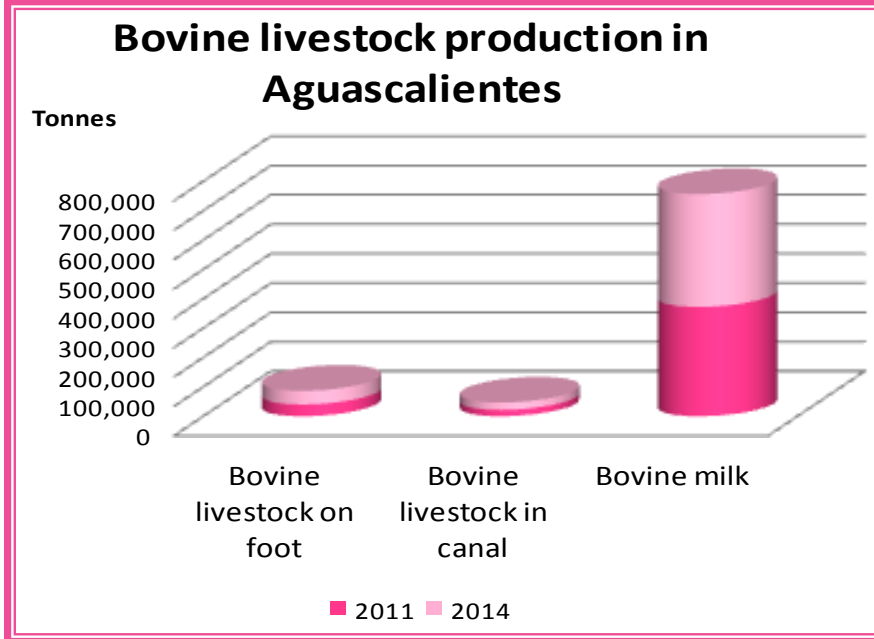
In the state of Aguascalientes the main livestock production is bovine, which production is around 40,146 tonnes in foot, 21,495 tonnes in canal and 372,252 thousands of milk liters for the year of 2011; whilst for the year of 2014 numbers changed, where bovine livestock on foot was of 46,510 tonnes, 25,057 tonnes

Table 32. Table of supply and use of land for livestock at state level 2011-2014.

Production, price, value, sacrificed animals and weight in Aguascalientes						
Product/specie	**2011**			**2014**		
	Production (tonnes)	**Sacrificed animals (heads)**	**Weight (kilograms)**	**Production (tonnes)**	**Sacrificed animals (heads)**	**Weight (kilograms)**
Livestock in foot						
Bovine	40,146		4,429	46,510		440
Ovine	1,089		481	837		44
Goat	411		413	298		38
Subtotal	**41,646**			**47,645**		
Meat in canal						
Bovine	21,495	99,633	2,373	25,057	105,610	237
Ovine	547	24,835	241	439	19,151	23
Goat	198	10,901	200	155	7,813	20
Subtotal	**22,240**			**25,651**		
Milk						
Bovine	372,252			384,293		
Goat						
Subtotal	**372,252**			**384,293**		
Another products						
Honey	217			551.50		
Wax						
Dirty wool						
Subtotal	**217**			**551.50**		
Total	**436,355**			**458,140**		

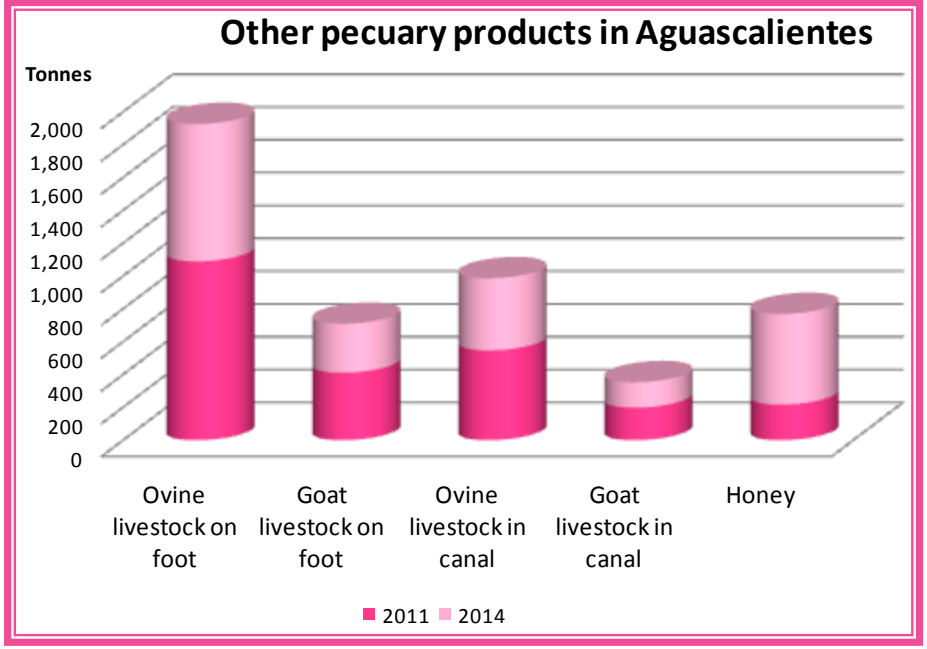
Source: SAGARPA, *Servicio de Información Agroalimentaria y Pesquera*.
Note: Milk production is expresed in thousands of liters. Subtotals and totals might not coincide by rounding.

Graphic 33. Main livestock production at state level 2011-2014.



Source: http://www.sagarpa.gob.mx/saladeprensa/2012/

Graphic 34. Another pecuary production at state level 2011 -2014.



in canal and 384,293 thousands of milk liters.

Another livestock production includes ovine and goats, in canal and in foot, such as honey too. This last product had an important increase in the year of 2014 in comparison with the quantity produced in 2011.

4.2 Carbon

Ecosystems offers two types of services around carbon: sequestering and storage. Carbon sequestering is defined as the net accumulation of carbon in an ecosystem due to vegetation increase and the accumulation in reservoirs of carbon underground (SEEA-EEA, A3.17). Carbon storage refers to the flow of avoided carbon resultant of keep the aerial carbon stock and from subsoil sequestered in the ecosystem (SEEA-EEA, A3.17).

Table 33. Municipal table of organic carbon in soil 2002, 2007, and 2011.

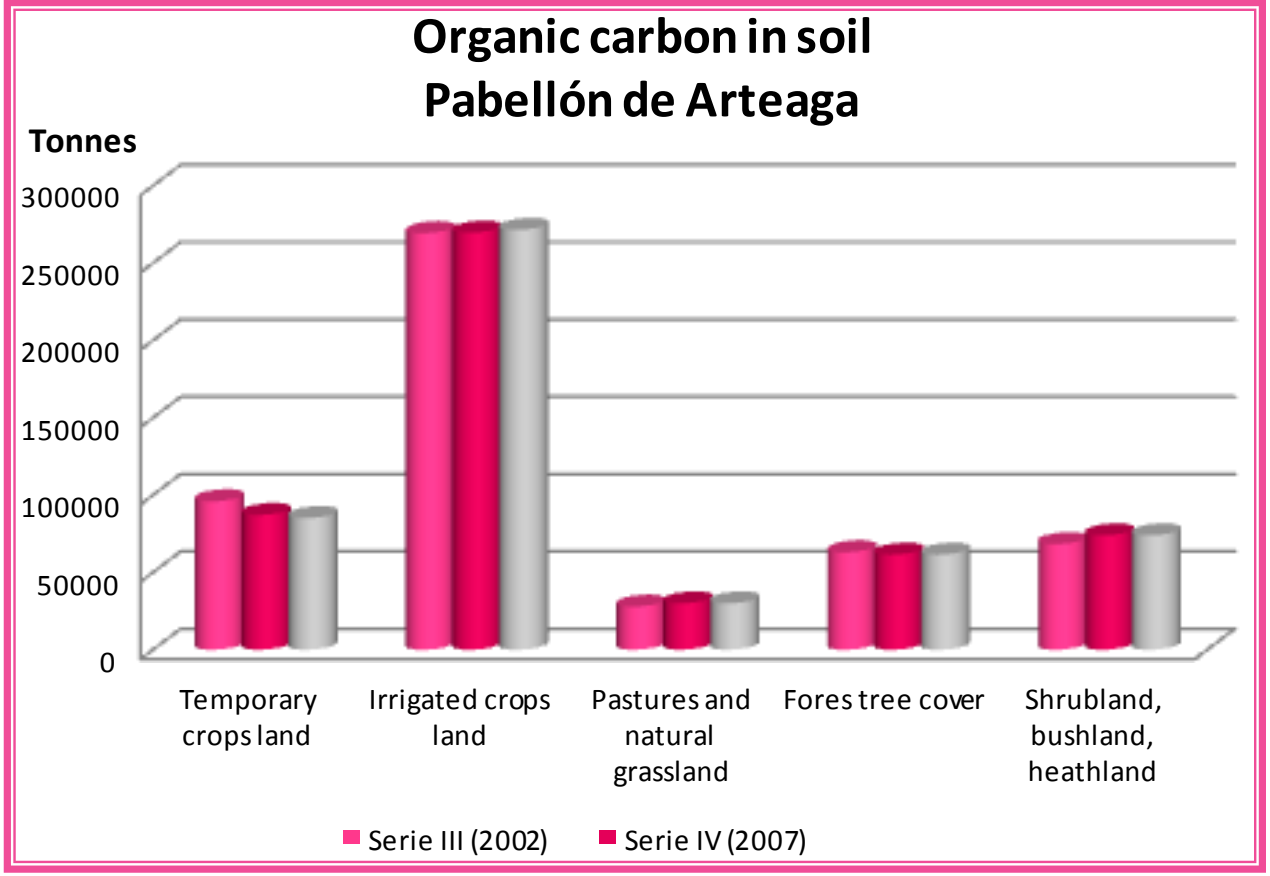
ORGANIC CARBON IN SOIl. PABELLON DE ARTEAGA						
Type of LCEU	**Serie III (2002)**		**Serie IV (2007)**		**Serie V (2011)**	
	Area (Km^2)	**Tonnes**	**Area (Km^2)**	**Tonnes**	**Area (Km^2)**	**Tonnes**
Urban and associated developed areas	**3.48**	0.00	**3.87**	0.00	**3.87**	0.00
Temporary crops land	**31.82**	96,053.71	**28.91**	87,258.78	**28.23**	85,210.73
Irrigated crops land	**101.54**	269,463.82	**101.65**	269,756.74	**102.33**	271,537.61
Permanents crops	**NA**	NA	**NA**	NA	**NA**	NA
Pastures and natural grasslands	**11.77**	27,943.40	**12.40**	30,064.05	**12.4**	30,063.94
Forest trees cover	**21.36**	63,114.06	**20.81**	61,526.12	**20.82**	61,526.18
Shrubland, bushland, heathland	**27.48**	68,356.85	**29.79**	73,992.60	**29.79**	73,992.53
Barren land	**NA**	NA	**NA**	NA	**NA**	NA
Total	**197.45**	**524,931.85**	**197.43**	**522,598.29**	**197.44**	**522,330.98**

Supply and use tables present catched tonnes of carbon for each LCEU according to estimated averages for every land use classification and vegetation of INEGI, and from data of the National Map of Organic Carbon in Soil. These had been previously recordered in land condition account, as a feature of this component; in contrast, in supply and use account are included as a ecosystem service.

Due to the nature of carbon, it can not be identified the ecosystems which exchange carbon flows, in other words, emisors.

In the municipality of Pabellón de Arteaga, temporary crops land catches on average 30 tonnes of carbon per hectare (tonC/ha); irrigation agricultural 26.54 tonC/ha; forest tree cover 29.55 tonC/ha; whilst pastures 24.24 tonC/ha and shrubland catches 26.54 tonnes of carbon per hectare.

Graphic 35. Organic carbon in land at municipal level 2002,2007 and 2011.

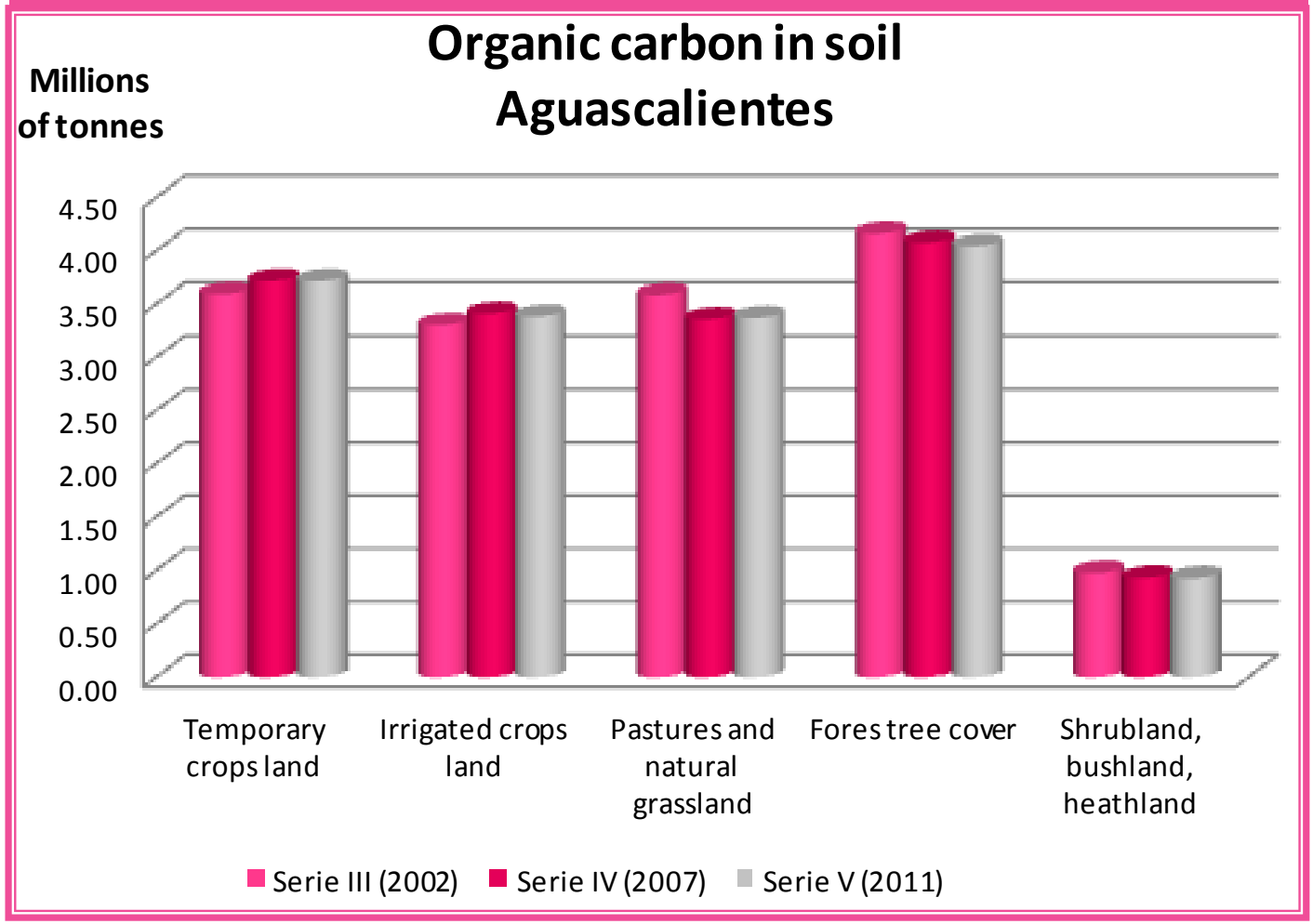


Organic carbon stored in soil of the state of Aguascalientes ascended more than 15 millions of tonnes in 2002, and had a downward trend due to land cover and vegetation changes. Because of the different types of forest tree cover (primary and secondary vegetation) have diverse capacity of carbon capture, at state level forest tree cover catches on average 33 tonC/ha, even less than permanent crops, which catch on average 36 tonC/ha.

Table 34. State table of organic carbon in soil 2002, 2007 and 2011.

ORGANIC CARBON IN SOIL. AGUASCALIENTES						
Type of LCEU	Serie III (2002)		Serie IV (2007)		Serie V (2011)	
	Area (Km^2)	Tonnes	Area (Km^2)	Tonnes	Area (Km^2)	Tonnes
Urban and associated developed areas	**111.52**	NA	**160.15**	NA	**175.14**	NA
Temporary crops land	**1,179.92**	3,592,343.84	**1,219.88**	3,714,166.38	**1219.56**	3,713,158.10
Irrigated crops land	**1,226.79**	3,299,129.62	**1,266.32**	3,407,779.85	**1256.51**	3,380,516.31
Permanents crops	**0.99**	3,618.33	**0.99**	3,618.33	**0.99**	3,618.33
Pastures and natural grasslands	**1,405.02**	3,583,658.68	**1,316.90**	3,355,199.70	**1321.4**	3,367,926.06
Forest tree cover	**1,254.41**	4,158,087.56	**1,231.70**	4,075,378.02	**1221.35**	4,040,489.82
Shrubland, bushland, heathland	**393.36**	976,815.75	**375.42**	930,339.46	**373.73**	926,124.46
Barren land	**NA**	NA	**0.62**	1,718.51	**0.62**	1,718.51
Total	**5,572.01**	**15,613,653.79**	**5,571.99**	**15,488,200.25**	**5569.3**	**15,433,551.59**

Graphic 36. Organic carbon in land at state level 2002, 2007 and 2011.



Temporary crops catch on average 30 tonC/ha, whilst irrigated crops catch about 27 tonC/ha. Shrubland average 25 tonC/ha, on the other hand pastures catch on average 24 tonC/ha. Finally, in barren land was recordered an average of 28 tonC/ha. The reduction in the total of stored carbon in the land of Aguascalientes is in orden to the changes of land coverage and vegetation, as the reduction of forest tree cover and the extent of urban areas and irrigated crops.

4.3 Water

Tables of supply and use of water register the service of provisioning ecosystem water. "Ecosystem service is the quantity of water (before treatment) extracted from a superficial water source or a little deep aquifer".

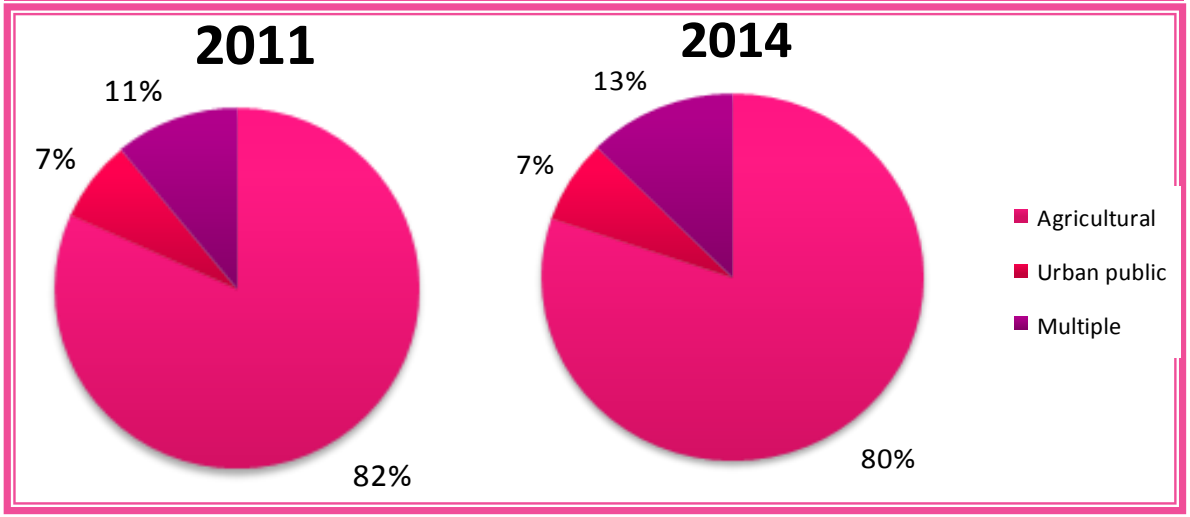
Supply and use tables register extracted water from each municipality, and its uses in the different sectors of the economy.

UNSD (2014). *SEEA-EEA*, p. 65.
SEMARNAT, (2013). *Unidades de Manejo para el Aprovechamiento Sustentable de la Vida Silvestre 2010*.
CONABIO, **Instituto del Medio Am**

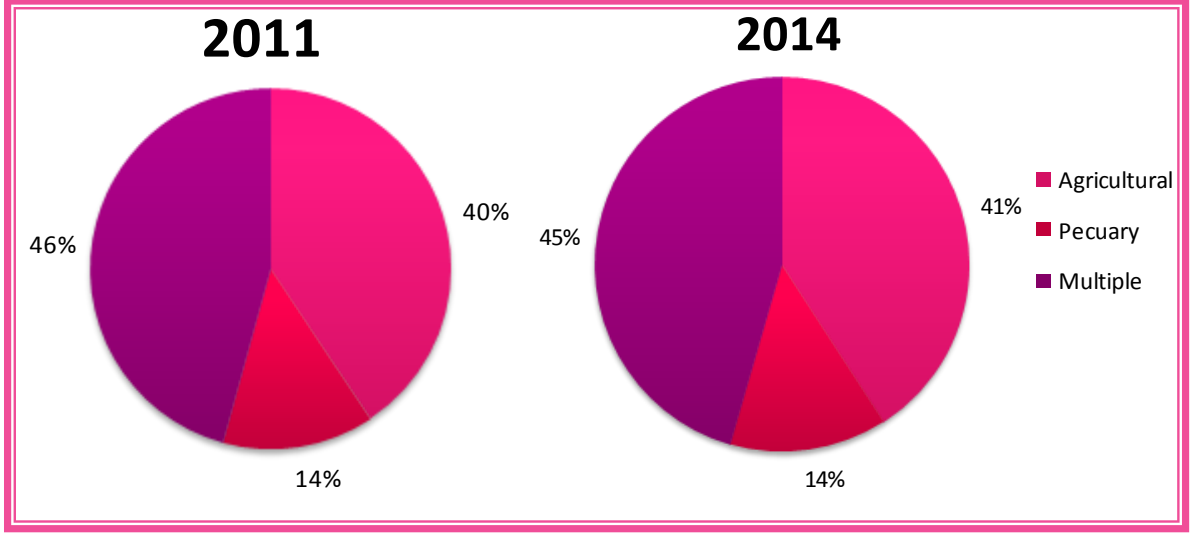
Table 35. Supply and use of municipal water 2011-2014.

Supply and use of water in the municipality of Asientos				
Uses	**Groundwater source**		**Surface water source**	
	2011 (m^3)	**2014 (m^3)**	**2011 (m^3)**	**2014 (m^3)**
Agricultural	34,011,103	33,465,703	4,023,575	4,063,575
Agroindustrial	0	0	0	0
Domestic	16,647	16,647	0	0
Aquaculture	0	0	0	0
Services	0	0	0	0
Industrial	0	0	0	0
Pecuary	100,881	100,881	1,351,942	1,351,942
Urban public	3,052,698	3,052,698	6,570	6,570
Multiple	4,533,997	5,202,216	4,525,902	4,525,902
Hydroelectric	0	0	0	0
Business	0	0	0	0
Others	0	0	0	0
Thermoelectrics	0	0	0	0
Total	**41,715,326**	**41,838,145**	**9,907,989**	**9,947,989**
Number of sources	**525**	**534**	**135**	**138**

Graphic 37. Groundwater uses. Municipal. 2011-2014.



Graphic 38. Surface water uses. Municipal. 2011-2014.



Source: CONAGUA (2015).

In the municipality of Asientos supply of 525 and 534 sources of groundwater corresponded to 41, 715,326 m^3 and 41, 838,145 m^3 of water in 2011 and 2014 respectively.

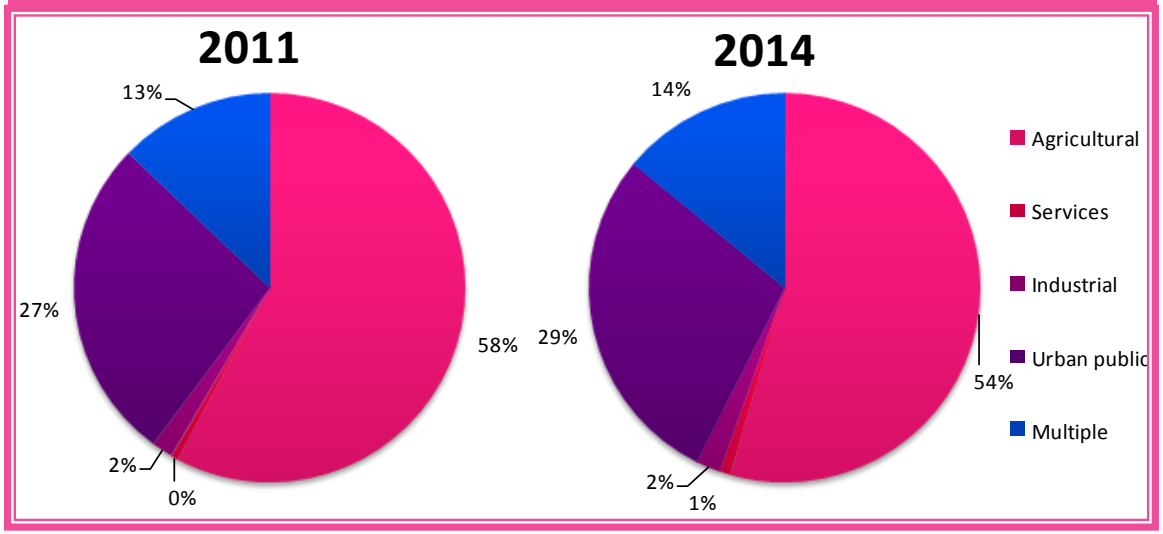
In 2011, the 81.53% from groundwater extracted was destined to agricultural use, the 7.32% to urban public use and the 10.87% to multiple uses.In 2014, the 79.99% of groundwater extracted was destined to agricultural use, the 7.30% to urban public use and the 12.43% to multiple uses. In the case of surface water, 9, 907,989 m^3 and 9, 947,989 m^3 of water were obtained from 135 and 138 sources in 2011 and 2014 respectively.

In 2011, the 40.61% of surface water extracted was destinated to agricultural use, the 13.64% to pecuary use and the 45.68% to multiple uses. In 2014, the 40.85% of surface water extracted was destinated to agricultural uses, the 13.59% to pecuary use and the 45.5% to multiple uses.

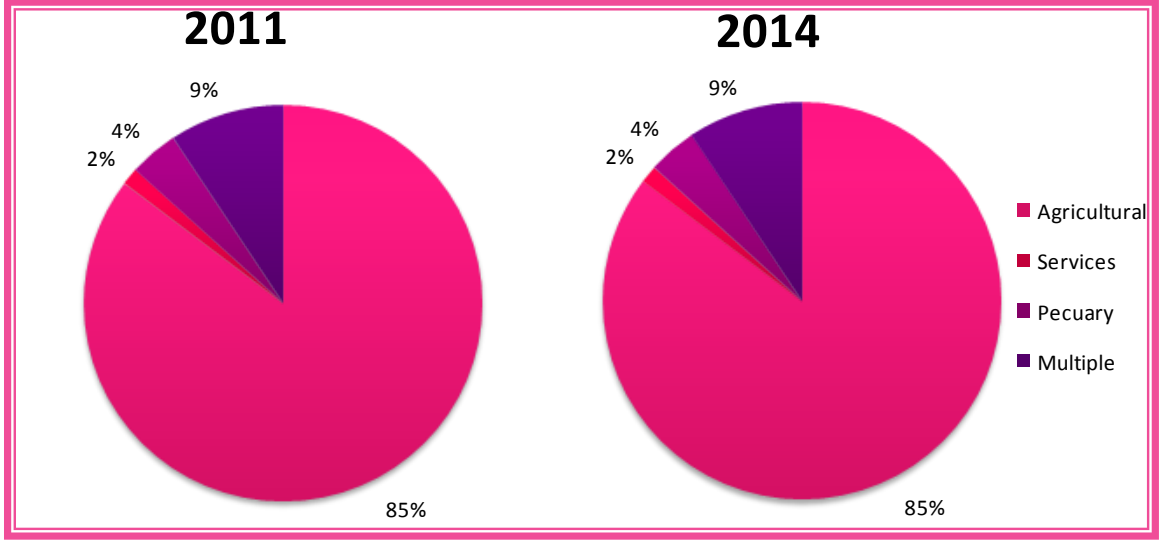
Table 36. Supply and use of water at state level 2011-2014.

Supply and use os water in the state of Aguascalientes				
Uses	**Groundwater sources**		**Surface sources**	
	2011 (m^3)	**2014 (m^3)**	**2011 (m^3)**	**2014 (m^3)**
Agricultural	253,919,533	240,860,986	114,045,635	114,083,257
Agroindustrial	45,125	45,125	0	0
Domestic	629,928	679,928	33,860	33,860
Aquaculture	68,829	55,063	10,512	10,512
Services	2,656,455	4,108,767	1,906,412	1,906,412
Industrial	7,679,364	9,082,880	0	0
Pecuary	960,418	960,418	5,304,274	5,350,840
Urban public	118,343,185	126,128,140	261,801	261,801
Multiple	56,522,349	62,079,785	12,465,669	12,465,669
Hydroelectric	0	0	0	0
Business	0	0	0	0
Others	0	0	0	0
Thermoelectrics	0	0	0	0
Total	**440,825,186**	**444,001,093**	**134,028,163**	**134,112,351**
Number of sources	**3,825**	**3,965**	**1,494**	**1,508**

Graphic 39. Groundwater uses. State. 2011-2014.



Graphic 40. Surface water uses. State. 2011-2014.



Source: CONAGUA (2015).

In the state of Aguascalientes in 2011 was extracted 440, 825,186 m^3 of water from 3,825 groundwater sources. The 57.60% was destined to agricultural use, the 0.60% to services sector, the 1.74% to industrial use, the 26.85% to urban public use and the 12.82% to multiple uses. In 2014 was extracted 444, 001,093 m^3 of water from 3,965 groundwater sources. The 54.25% was destinated to agricultural use, the 0.93% to services sector, the 2.05% to industrial use, the 28.41% to urban public use and the 13.98% to multiple uses.

In 2011 were extracted 134, 028,163 m^3 of water from 1,494 surface sources. The 85.09% was destined to agricultural use, the 1.42% to services sector, the 3.96% to pecuary use and the 9.30% to multiple uses. In 2014 were extracted 134, 112,351 m^3 of water from 1,508 surface sources. The 85.07% was destined to agricultural use, the 1.42% to services sector, the 3.99% to pecuary use and the 9.29% to multiple uses.

4.4 Biodiversity

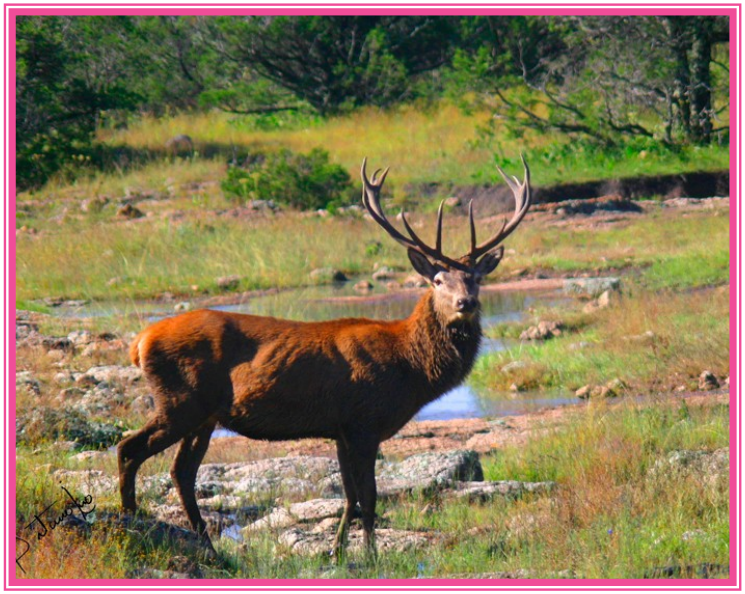
The use of biodiversity is presented through supply and use of species in the Units of Management for Conservation of Wild Life (UMA in spanish), and for the specific case of synergistic use are registered the hunting licenses.

UMAs are units where is protected and conservated wild life through plans of management of fauna and flora to production of breeding feet, ecotourism, source of germplasm, environmental education, sport hunting, conservation and others. There are regulated by the General Law for Wild Life and are the unique places where is allowed hunting and extraction of specimens. UMAs can be established in little or extensive propierties which can be ejidales, communal, federal, state, municipal or private, no matter the regimen of tenure of land. UMAs are divided in extensives (or of free life) and intensives (where species management is controllated and regularly in closed facilities). The Secretary of Environment and Natural Resources (SEMARNAT in spanish) reported existence of 2 intensive UMAs in 2002 and one extensive UMA in 2011, whilst there is no register of UMAs for the year of 2014. In the publication about biodiversity in Aguascalientes are reported 43 UMAs in 2007, from those 24 were intensives and 19 extensives.

Table 37. Synergistic use of biodiversity in Aguascalientes. 2002, 2011, 2014.

Sport Hunting Licenses		
Calendar Year	**Anual licenses**	**Undefined licenses**
2002	0	0
2011	201	6
2014	149	53
Total	**350**	**59**

Source: SEMARNAT, General Dictorate for Wildlife.



Source: http://vivaaguascalientes.com/sierra-fria/

SEMARNAT, (2013). *Unidades de Manejo para el Aprovechamiento Sustentable de la Vida Silvestre 2010*.
CONABIO, Aguascalientes State Institute of Environmental (IMAE), Autonomous University of Aguascalientes (UAA). 2008. *La Biodiversidad en Aguascalientes: Estudio de Estado*. Table 4.9.1.

5. ECOSYSTEM SERVICES VALUATION

Source: http://200.12.166.51/janium/Galerias/12546/images/Visiones2016_053.jpg

5. ECOSYSTEM SERVICES VALUATION

5.1 Carbon valuation

Regulation services support and let the creation of economic activities through the positive externalities that generate (SEEA-EEA, 5.67).

There are cases in which can be included as part of the consumidor's excedent, but generally are asociated to producer's excedent , by allowing production to take place or prevent production damage (SEEA-EEA, 5.67-68). According to SEEA-EEA, sequester and capture of carbon are flows of services that are expresed just in possitive values in tonnes of carbon equivalent at year (SEEA-EEA, A3.17). Respective services are defined on the following way:

Carbon sequestering: net acummulation of carbon in an ecosystem due to the increase of vegetation and to the accumulation of reservoir of carbon from subsoil (SEEA-EEA, A3.17).

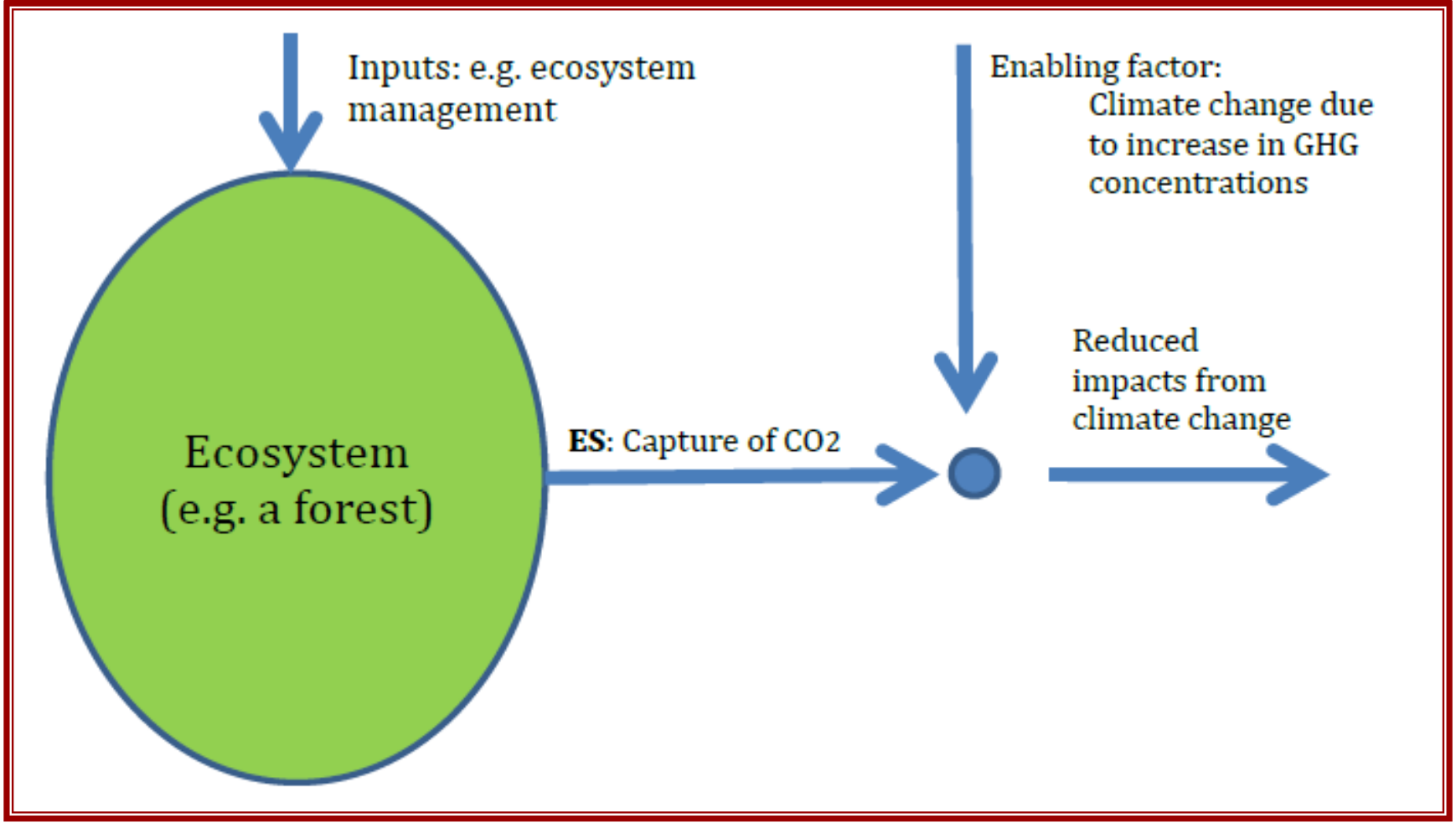
Carbon storage: flows avoided of carbon, resulting from keeping stock of aerial carbon and from subsoil sequestered on the ecosystem (SEEA-EEA, A3.17).

This last one implies calculate avoided emissions, it means that carbon which is in danger of being liberated in a short term because of changes in land uses, fires, etc. (SEEA-EEA, A3.18).

The next figure shows how management of ecosystem influences in sequestering and net storage of carbon in soil; the enabling factor is the existence of climate change, it causes that sequestering and storage of carbon provide economic benefits that resullts from avoided dangers, in the present and future (SEEA-EEA, A3.19).

[7] In the methodological document is shown the information for all the municipalities in Aguascalientes.

Figure 9. Kidnapping of Carbon



Source: SEEA-EEA. Sequestering of carbon. Figure A3.4.

5.1.1 Valuation methods (SEEA)

In the context of comparing the values of ecosystem services with those registered in national accounts, the objective is value the quantity of ecosystemic services at market price that would have existed if services were marketed and exchanged (SEEA-EEA, 5.20). In this way, when an ecosystem service is linked to the production value of a good into the SCN, valuation approches must be center in the determination of the contribution of ecosystem service at market price of the product, more than in the directly valuation of ecosystem service (SEEA-EEA, 5.57).

According with the SEEA-EEA, for carbon valuation it can be realized an initial estimation based on voluntary market prices, and, in the way that compliance markets mature and include storage and/or sequestering of carbon in ecosystems, it will be able used the new prices (generally higher) of these markets (SEEA-EEA, 5.91)

The method of replacement cost estimates the value of a ecosystem service which is based in costs associated with mitigation actions.

The method of treatment costs implies estimate the value of a ecosystem service bases in the costs to repair the damage that would be produced by the absence of that service.

Conceptually can be made an indirect allusion to the replacement cost, due to this estimates the value of an ecosystem service based in costs that would be associated with mitigation actions (SEEA-EEA, 5.84). Another method related is the method of treatment costs, which implies estimate the value of an ecosystem service bases in the costs to repair the damage that would be produced by the absence of that service (SEEA-EEA, 5.86).

5.1.2 Carbon price

There are two approches to determinate carbon price:

Carbon Social Cost (CSC): social damage avoided for not break free the carbon at the atmosphere (Tol, 2005; Stern, 2007) will tend to increase when the stock of atmospheric greenhouse gases and their damage increase too (Stern, 2007).

Market price: set price in two types of markets, those related with the right limit to emit contamination and the markets of ecosystem services (SEEA-EEA, 5.88).

The project called Innovation Modelling Comparison Project (Grubb et al., 2006) shows the evolution of carbon prices necessary to achieve the stabilization, furthermore evidence that comprise a broad range, in absolute terms such as in the time profile. For the stabilization in 450 ppm (around of CO_2e 500-550ppm), the majority of models shows that carbon prices start at low prices and increase in a range of US$240/ton CO_2 to US$540/ton CO_2 for the year of 2030, and there are into the range of US$180/ton CO_2 to US$900/ton CO_2 for the year of 2050, according as well as the carbon social increase is necessary to encourage mitigation options more expensive due to accomplish with the reduction goal (Stern, 2007).

For the case of Limburg in Países Bajos (Remme, 2016), carbon sequester was valued using the CSC:

> The CSC is based on the estimated economic damages of marginal increase in emissions of CO_2, it usually is mesuared in metric tonnes per year (United States Government, 2013). CSC was used according with the calculated by the United States Government, that brings values of CSC for three different discount rates of market (2.5%, 3.0% and 5.0%). We converted dollar prices at euros using average exchange rate for the year of 2010. Then, we converted the prices of €/ ton CO_2 to €/ton C. Carbon prices were calculated in euros of 2010, for the three discount rates. It was assumed that the CSC was between 32€/t C (discount rate of 5%) and 150 €/t C (discount rate of 2.5%).

The values obtained are conservative estimates due to the incomplete information about future impacts of the climate change (IPCC, 2007). The CSC was multiplied by the biophisical quantities of the model of carbon kidnapping in Remme et al. (2014) to calculate the quantity of carbon sequester in Limburg. For more calculations we use the highest discount rate aplicated for the United States Government (2013) (this is 5%) as low border value of this ecosystemic service. The discount rate chosen differs from the return rate aplicated in the approach of the rent of the resource, due to discount rate is aplicated for a different purpose comparing with the return rate about fixed capital. The discount rate includes aspects as human health and no market sectors, and it is use to analize the CSC (United States Government , 2010), whilst return rate is linked with the financial capital.

It is important to say, that the social cost of CO_2 estimated by the United States Government (2013), using in the case of Limburg, it is estimated in dollars of 2007 per metric tonne of CO_2 for the period of 2010-2050. There were selected four values of CSC: three values are based in the average CSC of three models of integral evaluation, using interest rates of 2.5, 3,and 5 percentage, the fourth value corresponds to the estimation of 95° percentil from CSC on the three developed models at a discount rate of 3% (to represents higher impacts of the expected by temperature change more than the distribution tales of the CSC to discount rates of 5%, 3% and 2.5%). These estimations are shown in the next table.

Table 37. Social Cost of CO_2, 2010-2050 (in dollars of 2007 per metric tonne CO_2).

Discount rate	5.00%	3.00%	2.50%	3.00%
Year	Average	Average	Average	95°
2010	11	33	52	90
2015	12	38	58	109
2020	12	43	65	129
2025	14	48	70	144
2030	16	52	76	159
2035	19	57	81	176
2040	21	62	87	192
2045	24	66	92	206
2050	27	71	98	221

For the estimation of the total costs of climatic change for the mexican economy (Galindo, 2009) were used two prices per tonne of CO_2 as extrem scenarios : 10 and 30 dollars, this last one taken from Stern (2007). These same from the accumulated impact values were used in the estimation of economic prices from climatic change and the mitigation for Latin America and the Caribe, (Galindo and de Miguel, 2009). In the case of Central America, the calculation of the volumen of avoided emissions and the evaluation of the accumulated costs is related at price of 10 and 30 dollars per carbon tonne as range of the future of carbon bonds, acknowledging the existence of quite uncertaintly about this market at short term. In this estimation, the difference between the base and the decrease scenario generates a volume of emissions that, at different prices, allows to calculate a flow of expenses that gives the economic valuation of the cost of the estabilization of emissions. This flow neither include the stabilization of emissions related with deforestation, nor social costs of efforts to reduce the carbonic intensity on the base scenario (CEPAL, 2011).

Academic researches about estimation of carbon capture in Mexican ecosystems are abundant, there are a little studies that include its monetary valuation, and these refleject two perspectives of carbon prices.

Balam de la Vega (2013) uses market price of 10 dollars for the economic valuation of the carbon capture on the forest reserve of Xilitla of San Luis Potosí. Bautista-Hernández and Torres-Pérez (2003), in their economic valuation of carbon sorting from the tropical forest of the ejido of Noh Bec in Quintana Roo, use this same price of 10 dollars per carbon tonne per hectare at year, understanding it as the cost of the opportunity that the compromised area on sale of the environmental service, it is derived from a feasibility study considering the cost of establishment and maintenance of the jungle. On another hand, the literary review of Torres-Rojo and Guevara-Sanginés (2002) enlarged the rage between 5 and 20 dollars:

> Nordhaus (1992) suggests a marginal cost of US$5/t of C, whilst Frankhauser (1995) estimates this cost in US$20/t of C due to the risks derivaded from the climatic change, discount rates an others. Consultants business about this topic use an standar of US$10/t of C.

In following to this rage, Díaz Gustavo (2011) used an average value of 5 dollars per tonne of CO_2 in his economic and technical feasibility study of the entensive plantation of palo colorado for the market of carbon bonds in the North of Sinaloa. On another hand, Hernández-Gómez (2015), estimated the cost of maintenance and carbon capture of an intensitive production system of potato and a natural pasture in the plateau of the North of Mexico, reaching the values of 330.54 and 540 pesos per hectare by storage of C respectively.

The variations obey to the difference between C and CO_2 too, to convert CO_2 to C, for example, CO_2 mass is divided between the C mass, getting the value of 3.67.

5.1.3 Valuation exercise

Following the SEEA-EEA recommendations to use carbon market prices, it has been made a valuation exercise of organic carbon in soil for the State of Aguascalientes with the value of 10 dollars (Galindo, 2009). The exchange rate used is 12.77, corresponding to the year of 2013 because this is the base year of the National Accounting System of Mexico. The results are presented in the next table.

Source: http://www.aguascalientes.gob.mx/Estado/municipios/sanjose.aspx

Table 39. Organic carbon in soil.

Type of LCEU	ORGANIC CARBON IN LAND											
	Serie III (2002)*				Serie IV (2007)**				Serie V (2011)***			
	Area (Km^2)	Tonnes···	Dollars	Pesos of 2013§	Area (Km^2)	Tonnes···	Dollars	Pesos of 2013§	Area (Km^2)	Tonnes···	Dollars	Pesos of 2013§
AGUASCALIENTES												
Urban and associated areas	**80.2**	-			**110.3**				**119.5**			
Temporary crops land	**277.1**	836,569.2	8,365,691.8	106,821,519.1	**302.9**	914,313.9	9,143,138.5	116,748,735.1	**299.3**	903,358.0	9,033,579.6	115,349,777.3
Irrigated crops land	**301.8**	793,847.5	7,938,474.5	101,366,381.2	**306.5**	806,933.2	8,069,331.8	103,037,298.1	**301.8**	94,495.2	7,944,952.2	101,449,094.0
Permanent crops	**0.8**	2,783.2	27,831.8	355,383.6	**0.8**	2,783.2	27,831.8	355,383.6	**0.8**	2,783.1	27,831.3	355,377.4
Pastures and natural grasslands	**380.4**	931,519.9	9,315,199.4	118,945,781.0	**325.1**	788,648.5	7,886,484.8	100,702,524.1	**323.2**	784,194.3	7,841,943.2	100,133,772.8
Forest tree cover	**58.6**	179,863.6	1,798,635.5	22,966,776.4	**56.6**	173,982.9	1,739,829.1	22,215,877.9	**56.6**	173,982.5	1,739,825.2	22,215,827.8
Shrubland, bushland, heatland	**72.1**	179,102.1	1,791,021.2	22,869,549.8	**68.9**	170,523.2	1,705,231.5	21,774,101.2	**68.7**	169,979.8	1,699,797.9	21,704,719.5
Barren land												
Total	**1,171.1**	**2,923,685.4**	**29,236,854.2**	**373,325,391.1**	**1,171.1**	**2,857,184.7**	**28,571,847.4**	**364,833,920.0**	**1,169.8**	**2,828,792.9**	**28,287,929.3**	**361,208,568.8**
ASIENTOS												
Urban and associated areas	**4.2**	-	-	-	**6.9**	-	-	-	**6.9**	-	-	-
Temporary crops land	**217.5**	673,541.0	6,735,409.5	86,004,443.6	**203.6**	632,852.6	6,328,526.0	80,808,948.7	**203.6**	632,851.1	6,328,511.1	80,808,758.0
Irrigated crops land	**137.6**	362,233.9	3,622,339.2	46,253,648.7	**154.6**	407,022.5	4,070,225.3	51,972,706.7	**154.6**	407,023.7	4,070,236.7	51,972,852.0

Type of LCEU	ORGANIC CARBON IN LAND											
	Serie III (2002)*				Serie IV (2007)**				Serie V (2011)***			
	Area (Km^2)	Tonnes···	Dollars	Pesos of 2013§	Area (Km^2)	Tonnes···	Dollars	Pesos of 2013§	Area (Km^2)	Tonnes···	Dollars	Pesos of 2013§
Permanent crops												
Pastures and natural grasslands	**66.2**	166,243.7	1,662,436.8	21,227,655.5	**70.2**	178,673.1	1,786,730.9	22,814,767.0	**70.2**	178,673.1	1,786,731.4	22,814,773.3
Forest coverage												
Scrubs, bushes zones, healts	**121.3**	301,065.5	3,010,655.2	38,443,055.8	**111.5**	275,798.9	2,757,988.9	35,216,759.7	**111.5**	275,798.9	2,757,989.0	35,216,761.8
Barren land												
Total	**546.8**	**1,503,084.1**	**15,030,840.6**	**191,928,803.7**	**546.8**	**1,494,347.1**	**14,943,471.1**	**190,813,182.1**	**546.8**	**1,494,346.8**	**14,943,468.2**	**190,813,145.1**
CALVILLO												
Urban areas and associated	**4.0**	-	-	-	**4.0**	-	-	-	**7.6**	-	-	-
Temporary crops land	**40.2**	124,414.6	1,244,146.1	15,886,501.5	**49.7**	153,481.6	1,534,816.2	19,598,068.0	**9.8**	153,641.4	1,536,414.4	19,618,475.6
Irrigated crops land	**183.3**	553,164.4	5,531,643.7	70,633,558.6	**191.4**	578,203.7	5,782,036.9	73,830,828.5	**187.6**	566,514.7	5,665,146.8	72,338,259.9
Permanent crops												
Pastures and natural grasslands	**122.2**	390,619.4	3,906,193.7	49,878,187.1	**117.0**	373,691.7	3,736,916.7	47,716,689.6	**119.5**	381,986.2	3,819,862.0	48,775,817.7
Forest tree cover	**580.2**	1,863,058.8	18,630,588.3	237,893,981.8	**567.7**	1,829,943.1	18,299,430.7	233,665,430.0	**564.7**	1,819,115.6	18,191,156.0	232,282,870.6
Scrubs, bushes zones, healts												
Barren land												

Type of LCEU	ORGANIC CARBON IN LAND											
	Serie III (2002)*				Serie IV (2007)**				Serie V (2011)***			
	Area (Km^2)	Tonnes···	Dollars	Pesos of 2013§	Area (Km^2)	Tonnes···	Dollars	Pesos of 2013§	Area (Km^2)	Tonnes···	Dollars	Pesos of 2013§
Total	**929.8**	**2,931,257.2**	**29,312,571.8**	**374,292,229.0**	**929.8**	**2,935,320.0**	**29,353,200.4**	**374,811,016.1**	**929.2**	**2,921,257.9**	**29,212,579.2**	**373,015,423.7**
COSÍO												
Urban areas and associated	**2.0**	-	-	-	**2.0**	-	-	-	**2.0**	-	-	-
Temporary crops land	**17.1**	51,750.9	517,508.6	6,608,067.2	**17.1**	51,756.2	517,561.8	6,608,746.1	**17.1**	51,756.0	517,560.0	6,608,724.1
Irrigated crops land	**75.3**	197,650.9	1,976,508.8	25,238,040.6	**75.3**	197,643.5	1,976,434.9	25,237,097.2	**75.3**	197,643.7	1,976,437.2	25,237,126.0
Permanent crops												
Pastures and natural grasslands	**34.4**	80,672.9	806,728.6	10,301,117.8	**34.4**	80,675.5	806,755.3	10,301,458.5	**34.4**	80,675.5	806,754.6	10,301,449.9
Forest coverage												
Scrubs, bushes zones, healts												
Barren land												
Total	**128.8**	**330,074.6**	**3,300,746.0**	**42,147,225.7**	**128.8**	**330,075.2**	**3,300,752.0**	**42,147,301.8**	**128.8**	**330,075.2**	**3,300,751.8**	**42,147,300.0**
EL LLANO												
Urban areas and associated	**2.6**	-	-	-	**3.1**	-	-	-	**3.1**	-	-	-
Temporary crops land	**307.0**	927,094.8	9,270,947.5	118,380,729.1	**313.3**	945,979.3	9,459,792.9	120,792,095.3	**313.6**	946,730.2	9,467,302.2	120,887,981.4

Type of LCEU	ORGANIC CARBON IN LAND											
	Serie III (2002)*				Serie IV (2007)**				Serie V (2011)***			
	Area (Km^2)	Tonnes...	Dollars	Pesos of 2013§	Area (Km^2)	Tonnes...	Dollars	Pesos of 2013§	Area (Km^2)	Tonnes...	Dollars	Pesos of 2013§
RINCÓN DE ROMOS												
Urban areas and associated	**3.8**	-	-	-	**4.4**	-	-	-	**4.4**	-	-	-
Temporary crops land	**46.6**	146,565.5	1,465,655.3	18,714,952.2	**47.6**	149,601.3	1,496,013.3	19,102,593.3	**48.3**	151,761.3	1,517,612.8	19,378,398.1
Irrigated crops land	**137.5**	360,922.7	3,609,227.1	46,086,220.2	**138.5**	363,544.7	3,635,447.0	46,421,023.0	**138.7**	363,982.4	3,639,823.7	46,476,908.9
Permanent crops												
Pastures and natural grasslands	**149.5**	352,722.4	3,527,223.9	45,039,121.3	**146.1**	344,629.6	3,446,295.8	44,005,751.5	**146.1**	344,629.3	3,446,293.0	44,005,715.4
Forest tree cover	**15.7**	51,325.3	513,252.9	6,553,726.6	**16.6**	53,960.0	539,600.2	6,890,154.9	**16.6**	53,959.9	539,598.7	6,890,136.2
Scrubs, bushes zones, healts	**21.6**	53,737.8	537,378.0	6,861,779.6	**21.5**	53,541.8	535,418.4	6,836,757.8	**20.7**	51,347.4	513,474.2	6,556,552.6
Barren land												
Total	**374.6**	**965,273.7**	**9,652,737.1**	**123,255,799.8**	**374.7**	**965,277.5**	**9,652,774.7**	**123,256,280.5**	**374.6**	**965,680.3**	**9,656,802.5**	**123,307,711.3**
SAN FRANCISCO DE LOS ROMO												
Urban areas and associated	**4.2**	-	-	-	**6.9**	-	-	-	**6.9**	-	-	-
Temporary crops land	**31.0**	93,636.3	936,362.7	11,956,415.9	**34.7**	104,637.3	1,046,372.9	13,361,135.5	**34.7**	104,637.2	1,046,372.2	13,361,126.9
Irrigated crops land	**57.1**	149,834.4	1,498,344.3	19,132,358.0	**56.5**	148,221.2	1,482,211.5	18,926,358.1	**56.5**	148,221.0	1,482,209.6	18,926,334.4

Type of LCEU	ORGANIC CARBON IN LAND											
	Serie III (2002)*				Serie IV (2007)**				Serie V (2011)***			
	Area (Km^2)	Tonnes···	Dollars	Pesos of 2013§	Area (Km^2)	Tonnes···	Dollars	Pesos of 2013§	Area (Km^2)	Tonnes···	Dollars	Pesos of 2013§
Permanent crops	**0.2**	835.2	8,351.6	106,641.3	**0.2**	835.2	8,351.6	106,641.3	**0.2**	835.2	8,352.1	106,647.5
Pastures and natural grasslands												
Forest tree cover												
Scrubs, bushes zones, healts	**46.5**	115,486.4	1,154,863.8	14,746,456.1	**40.7**	100,838.0	1,008,380.4	12,876,009.3	**40.7**	100,838.3	1,008,382.5	12,876,036.7
Barren land												
Total	**139.0**	**359,792.2**	**3,597,922.4**	**45,941,871.3**	**139.0**	**354,531.6**	**3,545,316.3**	**45,270,144.1**	**139.0**	**354,531.6**	**3,545,316.4**	**45,270,145.5**
SAN JOSÉ DE GRACIA												
Urban areas and associated	**1.6**	-	-	-	**1.6**	-	-	-	**1.6**	-	-	-
Land of temporal crops	**85.0**	256,482.7	2,564,826.8	32,750,273.6	**93.1**	281,180.1	2,811,801.3	35,903,890.3	**93.1**	281,180.1	2,811,800.8	35,903,884.9
Irrigated crops land	**11.7**	31,122.1	311,220.9	3,973,979.4	**10.9**	28,999.1	289,991.1	3,702,895.9	**10.9**	28,999.1	289,991.2	3,702,897.9
Permanent crops												
Pastures and natural grasslands	**316.0**	790,705.8	7,907,057.7	100,965,219.9	**313.2**	782,190.0	7,821,900.3	99,877,845.1	**319.8**	798,178.9	7,981,789.1	101,919,465.1
Forest tree cover	**419.3**	1,492,319.3	14,923,192.7	190,554,247.6	**414.7**	1,460,208.4	14,602,083.6	186,454,005.4	**408.1**	1,438,635.8	14,386,358.0	183,699,404.8
Scrubs, bushes zones, healts	**11.5**	28,625.1	286,251.0	3,655,138.4	**11.5**	28,524.3	285,243.3	3,642,271.9	**11.5**	28,524.4	285,243.9	3,642,279.5

Type of LCEU	ORGANIC CARBON IN LAND											
	Serie III (2002)*				Serie IV (2007)**				Serie V (2011)***			
	Area (Km^2)	Tonnes‴	Dollars	Pesos of 2013§	Area (Km^2)	Tonnes‴	Dollars	Pesos of 2013§	Area (Km^2)	Tonnes‴	Dollars	Pesos of 2013§
Barren land	**845.0**	**2,599,254.9**	**25,992,549.1**	**331,898,858.9**	**845.0**	**2,581,102.0**	**25,811,019.5**	**329,580,908.5**	**845.0**	**2,575,518.3**	**25,755,183.0**	**328,867,932.2**
Total												
TEPEZALÁ	**1.6**	-	-	-	**3.1**	-	-	-	**3.1**	-		
Urban areas and associated	**69.2**	212,375.5	2,123,755.4	27,118,232.3	**68.2**	209,845.7	2,098,457.4	26,795,203.0	**68.6**	211,105.0	2,111,050.3	26,956,001.1
Temporary crops land	**68.8**	180,599.8	1,805,997.6	23,060,783.9	**68.1**	178,831.2	1,788,312.2	22,834,957.9	**68.3**	179,294.9	1,792,949.2	22,894,167.8
Irrigated crops land												
Permanent crops	**27.5**	85,513.3										-
Pastures and natural grasslands												
Forest tree cover	**64.8**	160,675.8	1,606,757.7	20,516,688.5	**65.8**	163,221.5	1,632,215.1	20,841,754.8	**65.3**	161,744.1	1,617,441.4	20,653,109.4
Scrubs, bushes zones, healts					**0.6**	1,718.5	17,185.1	219,435.9	**0.6**	1,718.5	17,185.1	219,435.9
Barren land	**231.9**	**639,164.4**	**5,536,510.7**	**70,695,704.6**	**205.8**	**553,617.0**	**5,536,169.8**	**70,691,351.7**	**205.9**	**553,862.6**	**5,538,625.9**	**70,722,714.1**
Total												
ESTATAL	**111.5**	-	-	-	**160.2**	-	-	-	**175.1**	-	-	-
Urban areas and associated	**1,179.9**	3,592,343.8	35,923,438.4	458,706,384.9	**1,219.9**	3,714,166.4	37,141,663.8	474,261,904.7	**1,219.6**	3,713,158.1	37,131,581.0	474,133,157.8
Temporary crops land	**1,179.9**	3,592,343.8	35,923,438.4	458,706,384.9	**1,219.9**	3,714,166.4	37,141,663.8	474,261,904.7	**1,219.6**	3,713,158.1	37,131,581.0	474,133,157.8

Type of LCEU	ORGANIC CARBON IN LAND											
	Serie III (2002)*				Serie IV (2007)**				Serie V (2011)***			
	Area (Km^2)	Tonnes‴	Dollars	Pesos of 2013§	Area (Km^2)	Tonnes‴	Dollars	Pesos of 2013§	Area (Km^2)	Tonnes‴	Dollars	Pesos of 2013§
Irrigated crops land	**1,226.8**	3,299,129.6	32,991,296.2	421,265,861.2	**1,266.3**	3,407,779.9	34,077,798.5	35,139,409.3	**1,256.5**	3,380,516.3	33,805,163.1	431,658,127.6
Permanent crops	**1.0**	3,618.3	36,183.3	462,024.6	**1.0**	3,618.3	36,183.3	462,024.8	**1.0**	3,618.3	36,183.3	462,024.6
Pastures and natural grasslands	**1,405.0**	3,583,658.7	35,836,586.8	457,597,376.9	**1,316.9**	3,355,199.7	33,551,997.0	428,425,449.6	**1,321.4**	3,367,926.1	33,679,260.6	430,050,478.6
Forest coverage	**1,254.4**	4,158,087.6	41,580,875.6	530,946,200.5	**1,231.7**	4,075,378.0	40,753,780.2	20,385,019.7	**1,221.4**	4,040,489.8	40,404,898.2	515,930,145.1
Scrubs, bushes zones, healts	**393.4**	976,815.8	9,768,157.5	124,729,603.1	**375.4**	930,339.5	9,303,394.6	118,795,045.6	**373.7**	926,124.5	9,261,244.6	118,256,832.3
Barren land					**0.6**	1,718.5	17,185.1	219,435.9	**0.6**	1,718.5	17,185.1	219,436.5

*The map of land use and vegetation corresponds to the Serie VIII of Land Uses and Vegetation from INEGI, scale 1:250,000. Produced in the period of 2002-2005 and adapted to Albers Equal Area projection with datum ITRF92.

**The map of land use and vegetation corresponds to the Serie V of Land Uses and Vegetation from INEGI, scale 1:250,000. Produced in the period of 2011-2013 and adapted to Albers Equal Area projection with datum ITRF92.

†INEGI, CONAFOR, PNUD. Organic carbon in land. Adapted to series III and V of Land Uses and Vegetation by the General Geography and Environment Direction Dirección General de Geografía y Medio Ambiente.

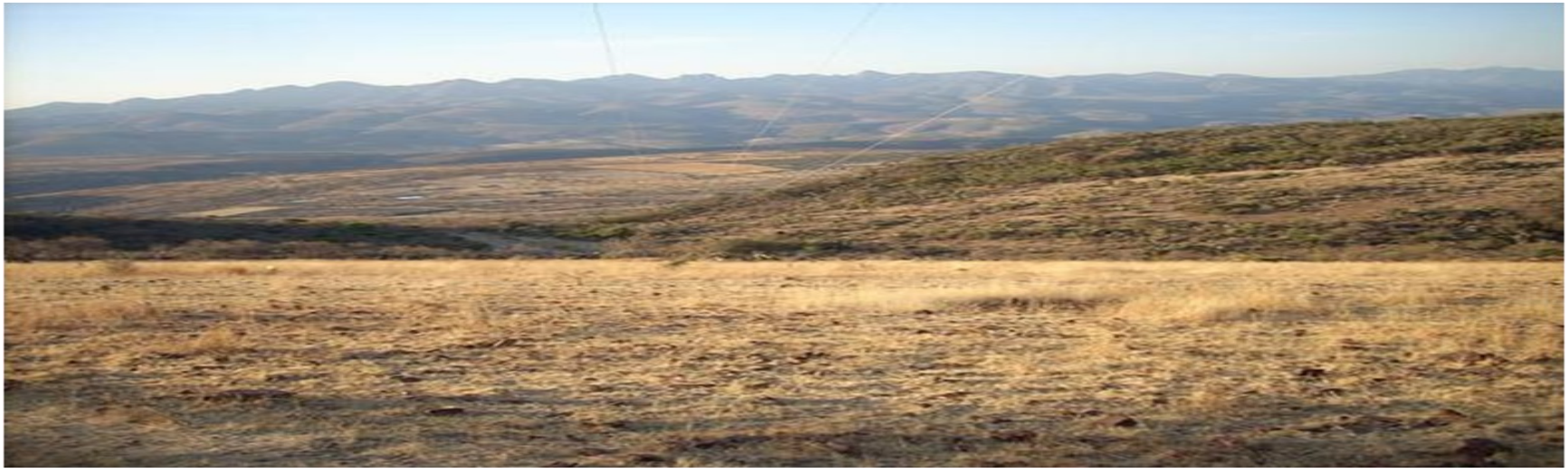
5.2 Prices of land services

Referent to erosion damages occasioned by society during the develop of economic activities, we know that estimated costs refer to the ecosystem services trying to keep the main characteristics of the land through actions that reverse the damage caused, which will depend of the type and grade of affectation.

Into the framework of proposed actions for the recovery of ecosystem services there are, among others, the incorporation of fertilizers, the construction of works to avoid that continue the lost of land, and even add land again to fill gullies and thus be able to use an area in the different economic activities.

5.2.1 Method of SEEA valuation

As part of the efforts to revert damages according to the Type of erosion, can be added fertilizers when is laminar or grooves type to keep the characteristics of the land and it can keep the level of the services that bring; when the damage is higher at grooves level, firstly it would be necessary to realize works since dam of branches until dam of masonry. Then, it will be necessary to add land to



Source: http://mexico.postecode.com/municipio.php?estado=Aguascalientes&municipio=Calvillo

replenish lost land, considering that this new land must bring the same services at a very similar level from the original that it had before it degradation.

5.2.2 Exercise of SEEA valuation

The costs to recovery the land, according to the mentioned before, are estimated from fertilizers prices with the quantity of nutrients required (nitrogen, N; phosphorus, P and potassium, K) depending the type of land use (agricultural, livestock, forestry). The costs of works to avoid erosion, are estimated according to the Manual of practical works.

Table 40. Costs of remediation by the erosion in the municipality of El Llano, for type of land use. Thousands of pesos, Tonnes

Type of LCEU**	Laminar Hydric				Grooves Hydric				Gulles Hydric				Wind			Subtotal of barren area	Anthropic
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3		
Temporary crops land	724	3,121	100	29												**3,974.46**	
Irrigated crops land	50	60														**110.14**	
Permanent crops																	
Pastures and natural grasslands	1,303	2,017	235	258												**3,813.24**	
Forest tree cover	400	74	35													**508.53**	
Total	2477	5272	370	287												**8,406.37**	

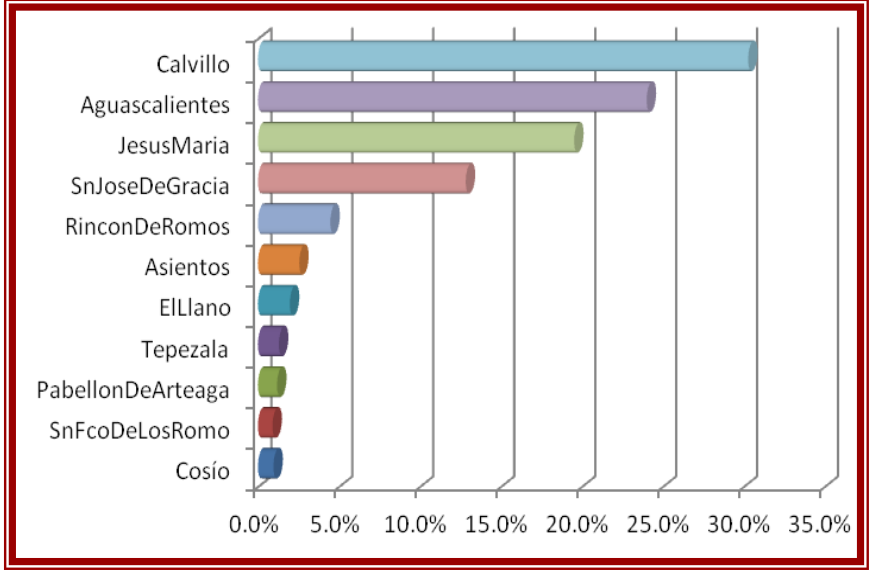
Finally, for costs to fill gulles are used the costs of production of compost from the plant of 18 de marzo in Mexico City.

In the following example, the municipality of El Llano does not have erosion at gulles level nor at anthropic level, so costs refer to laminar hydric erosion and grooves exclusively. The results of estimated prices and tonnes of land lost for municipality, type of soil and grade of affectation show that the municipality of El Llano has to realize an delivery of almost 8 millions 406 thousands of pesos in the year of 2012 to return to land its characteristics and it can continue bringing it services.

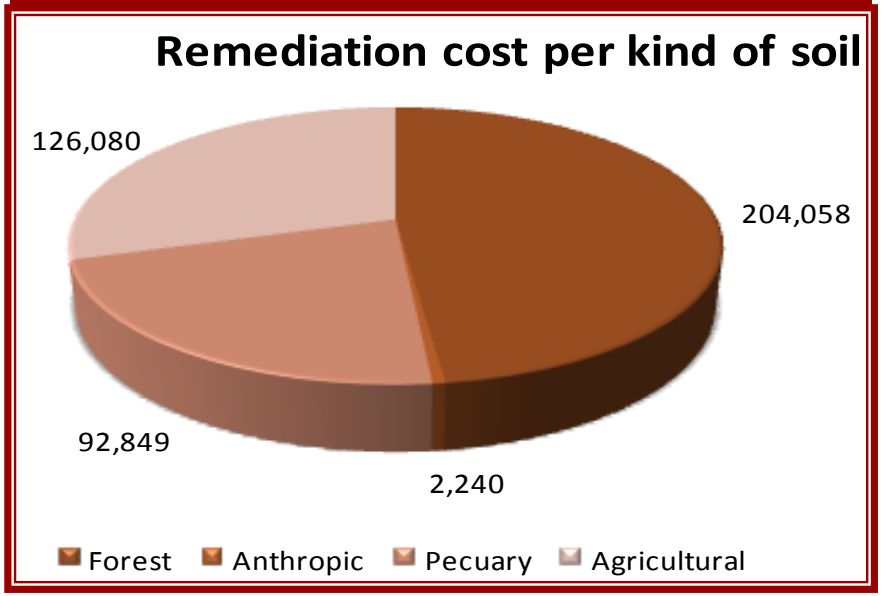
The distribution of costs according to the type of erosion and type of land used in this municipality can be seen in the next table.

The results for all municipalities can be seen in the technical document, whilst graphic 41 shows the participation per municipality in the total state's costs.

Graphic 41. Municipal hydric erosion, participation in remediation costs, by type of land use. (Percentage)



Graphic 42. Remediation costs in the State of Aguascalientes, by type of land use. (Thousands of pesos)



At state level results show that total costs for the 2012 would be 425 millions 227 thousands of pesos, being the highest investment for forest land 204 millions 058 thousands of pesos (47.9%), following by agricultural land with 126 millions 080 thousands of pesos (29.6%).

Table 41. Remediation costs for erosion in Aguascalientes by type of land use. (Thousands of pesos)

Type of LCEU**	LAMINAR HYDRIC				GROOVES HYDRIC				GULLES HYDRIC				Wind			Subtotal barren area	Anthropic
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3		
Temporary crops land	20,098	16,451	5,651	161	333	193	1,045		37,259	1,130	38					**83,503**	193
Irrigated crops land	8,785	4,463	2,426		3,845	1,550	242		19,057	1,724	1,727					**42,548**	1,550
Permanent crops		0				28										**28**	
Pastures and natural grasslands	8,467	25,333	5,927	629	10	452	1,053		44,373	1,570	4,689					**92,849**	452
Forest tree cover	23,024	40,439	3,808	6	931	44	139		111,746	17,953	5,751					**204,058**	44
Total	60,374	86,687	17,813	796	5,119	2,240	2,479		212,435	22,377	12,206					**422,987**	**2,240**

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Source: http://bdi.conabio.gob.mx/fotoweb/Grid.fwx

Source: http://vivaaguascalientes.com/canon-y-presa-de-malpaso/

Source: http://vivaaguascalientes.com/cerro-del-muerto/

Annexes

Annex I. Types of soil and their characteristics

INEGI. Guide for interpretation of edaphological cartography. *Units and subunits of land*.

Acrisol (AC): From latin *acris:* sour, acid; and *solum:* soil. Literally, acid soil. There are in tropical zones or very rainy temperate. Which are characterized for have an accumulation of clay on subsoil, too acid and poor of nutrients.

Andosol (AN): From the japaneses words *an: dark*; y *do: land*. Literally, dark land. They are from volcanic origin, mainly constituted by ash, which contains a high quantity of allofano, that brings it lightness and greasiness to the ground.

Arenosol (AR): From the latin *arena:* arena. Literally, sandy land. These lands are mainly located in tropical zones or very rainy temperate from the Southeast of Mexico. Their vegetation is variable and they are characterized for being of gross texture, with more than 65% of sand at least on the first meter of depth.

http://www.inegi.org.mx/inegi/SPC/doc/INTERNET/EdafIII.pdf

Cambisol (CM): From latin *cambiare:* change. Literally, land that changes. These lands are young, little developed and can be founded in every type of vegetation or weather, except in those of arid zones. They are characterized for presents on subsoil a layer with clods that show vestiges of the type of underlying rock, furthermore, can have little accumulations of clay, calcium carbonate, iron and manganese. Also belong to this unit some very thin soils that are placed directly above a tepetate.

Castañozem (KS): From latin, *castaneo:* chestnut; and the russian *zemljá:* land. Literally, chestnut land. Alkaline lands that are located on semiarid zones or of transition towards more rainy weathers. Frecuently, they have more than 70 cm of depth and they are characterized for present a top layer of brown color or dark reddish, rich in organic material and nutrients, with accumulation of free caliche or lightly cemented into the subsoil.

Chernozem (CH): From the russian *cherna:* black; and *zemljá:* land. Literally, dark land. Alkaline lands located in semiarid zones or of transition towards more rainy weathers. There are lands that commonly exceed 80 cm of depth and they are characterized to present a top layer of black color, rich in organic material and nutrients.

Phaeosem (PH) (Feozem): From greek *phaeo:* brown; and from the russian *zemljá:* land. Literally, brown land. It is characterized by having a dark top layer, soft, abundant in organic material and nutrients, similar to top layers of the Chernozems and Castañozems, but without presenting layers rich in lime like these two types of lands have.

Fluvisol (FL): From latin *fluvius:* river. Literally, river's lands. There are formed of materials carried by water. These lands are very undeveloped, moderately deep and generally present a weak or loose structure. They are located in all weathers close to river beds. Fluvisols present alternating layers of sand with rocks or rounded gravel, as effect of the current and increases of water in rivers.

Gleysol (GL): From russian *gley:* swamp. Literally, marshy land. These lands are located in zones where water is accumulated and stagnant most of the year into 50 cm of depth. They are characterized by presenting, in the part where are saturaded with water, gray, bluish and greenish colors, that many times where are dry and exposed to the air they are have stained. They are very variables in their texture but in México predominate clayey, and as consequence there are serious problems of floods during times of intense precipitation.

Histosol (HS): From greek *histos:* tissue. Literally, lands with organic tissues. They are lands with a very high content content of organic material (more than 20% in weight), generally of black color, spongy, light and with a high capacity of moisture retention. Frecuently, have a rotten smell and an important accumulation of saltpeter.

Luvisol (LV): From latin *luvi, luo:* wash. Literally, land with an accumulation of clay. They are characterized by having an enrichment of clay in the subsoil. They are usually red or yellow, although they can be brown too, but not dark.

Nitosol (NT): From latin *nitidus:* sparkly. Literally, sparkly land. Nitosols are reddish lands too sparkly and enriched of clay in all their thickness, at least until 150 cm of depth. They are very deep and have a very thin top layer of dark color, where organic part is mixed with the mineral part. It is important to say that their natural fertility is hight.

Planosol (PL): From latin *planus:* plane, flat. Connotative of lands usually developed in flat reliefs that in a part of the year are flooded on their surface. In most of the cases they are moderately deep among 50 and 100 cm. They are characterized by presenting under the top layer, an infertile layer and relatively thinner of a light material that usually is less clayey than the other layers.
Under this layer is presented a subsoil very clayey, but also it can be rock or tepetate, or all the waterproof. In other countries they are called as «duplex» by the contrast in their texture.

Litosol (LP): From the greek *lithos:* rock. Literally, land of rock. They are the most abundant land in the country, due to occupy 22 of each 100 hectares of land. They are characterized for their depth less than 10 cm, limited by the presence of rock, tepetate o hard caliche.

Ranker: From austrian *rank:* strong slope. Literally, lands with strong slope. They are characterized by being acids, with a thickness less than 25 cm, darck color due to a high content of organic material and because of they are directly above not carbonated rock.

Regosol (RG): From greek *reghos:* mantle, blancket or layer of loose material that covers the rock. They have little developed and that is the reason they do not present too much differences among their layers.

In general are light or poors in organic material, they are too similar to their origin's rock. Frecuently they are shallow, their fertility is variable and their productivity is conditioned to their depth and stony.

Rendzina: From polish *rzedzic*: noise. Connotative of shallow lands which produce noise with plow due to stony. They are characterized by having a top layer abundant in organic material that it is too fertile and is located above a limestone rock or materials rich in lime. They are usually clayey and a little deep.

Solonchak (SC): From russian *sol:* salt. Literally saline soils. They are located in zones where saltpeter is accumulated. Also, they have a high salts content in all of any soil part.

Solonetz (SN): From russian *sol*: salt, *etz:* strongly expressed. Connotative of soils with high concentrations of salts. They are characterized by having a clayey subsoil with hard clods in form of columns or prisms due to the high content of sodium salts. These soils are located in zones where are accumulated salts, in particular, sodium alkali. Their natural vegetation is too scarce and are pastures and scrubs.

Vertisol (VR): From latin *vertere:* flip. Literally, soil that is stirred or flipped. They are characterized by their massive structure, their high content of clay, and because of being collapsible dry can form cracks on the top or at determinated depth. Their most common color is black or dark gray.

Xerosol: From greek *xeros:* dry. Literally, dry soil. It is located in arid and semiarids zones. In general they have a surface layer of light color due to the less content of organic material. Under this layer can be a rich subsoil in clay, or well, one similar to surface layer. Many times shows at a certain depth stains, lime agglomerations, gypsum cristals or caliche with a hardness grade.

Yermosol : From spanish *yermo:* desert, bleak. Literally, bleak soil. Sometimes they have lime layers, gypsum and salts on the surface or in any part of subsoil. Surface layer of these is too poor in humus and usually lighter than Xerosol soils.

FAO. *Edaphology*[8].

Albeluvisol: derives from latin words "albus" that means white and "eluere" that means remove by wash. Original material is mainly constituted by not consolidated deposits of glacier origin, lacustrine, fluvial or wind of loess type. The top horizon is dark, thin and ocheric kind.

Alisol: derives from the latin Word "aluminium" that means aluminum, because of those have a high saturation of that element, also they are strongly acid and have a high activity of clay. Alisol soils are formed above a broad variety of materials with clays of high activity as vermiculita or esmectitas. Mainly they do it aobve acid rocks.

http://www.eweb.unex.es/eweb/edafo/FAO/

Antrosol: derives from the greek word "anthropos" that means man, referring at its main feature that is result of human activity. The original material can be whatever that has been modifficated by humans, through cultivation or addition of materials. The development of profile, at being strongly influenced by human activities, it is manifest on the top horizons. The buried soil can shows the presence of differentiated horizons yet.

Calcisol derives from the latin word "calcarius" that means calcareous, referring to the substantial accumulation of secondary limestone. The original material is constituted by alluvial, colluvials and wind deposits of alterated materials rich in bases. The top horizon is pallid and ochery type; the B horizon is cambic or argic impregnated by carbonates, even vertic. On the C horizon there is always an accumulation of carbonates.
http://www.eweb.unex.es/eweb/edafo/FAO/Calcisol.htm

Criosol: derives from the greek word "kraios" that means cold, ice, referring to the weather where they are. The original material encompasses a huge variety of not consolided materials, including glacial, eolic, alluvial, colluvial and residual deposits. The cryogenic processes causes the formation of criotubated horizons helped by freezing, thermal cracking, ice segregations and microrelief associated at all of that.

Durisol: derives from the latin words "durus" that means hard, referring to the hardness provocated by the secondary silex accumulation. The original material is constituted by alluvials and colluvials deposits with any texture.

Ferralsol: derives from the latin words "ferrum" that means iron and "aluminium" that means aluminum, referring to the high content in sesquioxides that shows these soils, red and yellow, tropicals. Their minerology explains their yellow color of the goethita or the red of the hematites.

Leptosol: derives from the greek word "leptos" that means thin, referring to the reduced thickness.The original material can be anyone, as rocks as not consolidated material with less than 10% of fine soil. There are from high or middle zones with a steep topography and high slope.

Lixisol: derives from the latin word "lixivia" that means clean or remove, referring to clay washing on top horizons to pile in the deepest zone. These are soils produced by a strong alteration. Predominate in old terrains subjected to a strong erosion or deposition.

Plintosol: derives from the greek word "plinthos" that means brick, referring to the plintitan's form. In many cases results crucial enought iron presence that origins the typical morphologic model of plintita (red).

Podzol (Podsol): derives from the russian words "pod" that means under and "zola" that means ash, referring that it top horizon has ash appearence and under it appear spodic horizon, originaded by illuviation of movil organo metal complexes illuviation with an elevated anion/cation relation. The complex Al, Fe and organic material migrate from horizon B surface with rain water.

Regosol: derives from the greek word "rhegos" that means bed sheet, referring to the alteration mantle that covers the soil. The profile evolution is minimal as consequence of it youth, or a slow formation process by a long dryness.

Umbrisol: derives from the latin word "umbra" thay means shadow, referring to the dark color of the top horizon.

Analysis units of the Serie I of Erosion

INEGI. *Dictionary of erosion soil data escale 1:250,000*.[9]

EROSION UNIT	Surface with removed sediments and transported by superficial runoff, most of movement is originated by an use or land cover change and it is accentuated by a geomorphological condition and/ or special dynamic. It represents the type, form and grade of erosion in dominant form or in association .
TYPE OF EROSION	Data that shows the most importasnt and representative present in the spatial object. **Domain of values:** H Hydric ANT Anthropic Stable land
EROSION FORM	Data that shows the most important and representative affectation present in the spacial object.. **Domain of values** C Gulles L Laminar S Grooves Other Not visible
DEGREE OF EROSIÓN	Data that indicates the affectation degree identified in the spacial object. **Domain of values:** 1: Mild 2: Moderate

INEGI (2015). *Diccionario de datos de erosión del suelo escala 1:250,000*.

3: Strong
4: Extreme

UNIT KEY

Combination of alphanumeric signs that identify dominant hydric erosion or in association. The structure is the next: Typem form and grade of dominant hydric erosion + Type, form and grade of secondaryhydric erosion.

ANT	Anthropogenic erosion
HC1	Hydric erosion in mild gulles
HC2	Hydric erosion in moderate gulles
HC3	Hydric erosion in strong gulles
HC4	Hydric erosion in extreme gulles
HL1	Mild laminar hydric erosion
HL2	Moderate laminar hydric erosion
HL3	Strong laminar hydric erosion
HL4	Extreme laminar hydric erosion
HS1	Mild hydric erosion in grooves
HS2	Moderate hydric erosion in grooves
HS3	Strong hydric erosion in grooves
HS4	Extreme hydric erosion in grooves
SEA	Estable soil by deep alluvial condition
SEC	Estable soil by dense tree cover

GEOMORPHOLOGICAL UNIT

Surface with possible evidence of erosion which in most parts are not caused by changes in land coverage but for a special geomorphological condition. The removal speed or transport of sediments in this surface is not recently nor comparable to erosion unit.

AFR	Rocky outcrop
CAE	Estable channel
DAB	Steep slope
DUN	Field of dunes
EOL	Wind activity
PAL	Marsh zone
SAL	Salt zone
ZAR	Sandy zone
ZIN	Flood zone

COMPLEMENTARY UNIT

Reference data which is actualizated based on database inputs and complements thematic information.

AH	Human settlement
H_2O	Water body
ISLAS	Island and islot
ZU	Urban zone

Anexo II . Wealth and relative abundance of mammals.

Wealth, distribution and relative abundance of mammals in Aguascalientes								
ORDEN	FAMILY	SCIENTIFIC NAME	COMMON NAME	RELATIVE ABUNDANCE				
				RARE	LESS COMMON	COMMON	ABUNDANT	ECOGEOGRAPHIC ZONE
Didelphimorphia	Didelphidae	Didelphis virginiana	Tlacuache or zarigüeya				X	ALL
Chiroptera	Phyllostomidae	Choeronycteris mexicana	Shrew	X				FRÍA
Soricomorpha	Soricidae	Notiosorex crawfordi	Shrew	X				FRÍA
Soricomorpha	Soricidae	Sorex saussurei	Shrew	X				FRÍA
Cingulata	Dasypodidae	Dasypus novemcinctus	Armadillo	X				MUE, VAG, SAB
Chiroptera	Emballonuridae	Balantiopteryx plicata	Murciélago sacóptero		X			VAG
Chiroptera	Mormoopidae	Mormoops megalophylla	Murciélago bigotudo de cara plegada		X			HUA, CAL
Chiroptera	Phyllostomidae	Desmodus rotundus	Murciélago vampiro			X		FRÍA, PINA, MONT LAU, HUA
Chiroptera	Phyllostomidae	Choeronycteris mexicana	Murciélago nectarívoro	X				VAG, HUA
Chiroptera	Phyllostomidae	Glossophaga soricina	Murciélago sirocotero		X			VAG
Chiroptera	Phyllostomidae	Leptonycteris curasoae	Murciélago nectarívoro		X			PINA, LAU, HUA
Chiroptera	Vespertilionidae	Idionycteris phyllotis	Murciélago nectarívoro		X			PINA, LAU, HUA
Chiroptera	Phyllostomidae	Artibeus hirsutus	Murciélago zapotero de patas peludas	X				HUA
Chiroptera	Phyllostomidae	Dermanura azteca	Murciélago zapotero azteca	X				HUA

Wealth, distribution and relative abundance of mammals in Aguascalientes								
ORDEN	FAMILY	SCIENTIFIC NAME	COMMON NAME	RELATIVE ABUNDANCE				
				RARE	LESS COMMON	COMMON	ABUNDANT	ECOGEOGRAPHIC ZONE
Chiroptera	Phyllostomidae	Sturnira lilium	Murciélago de charreteras	X				HUA
Chiroptera	Vespertilionidae	Idionycteris phyllotis	Murciélago de cuatro orejas	X				VAG, HUA
Chiroptera	Phyllostomidae	Choeronycteris mexicana	Murcielaguito orejas de mula mexicano			X		VAG, HUA
Chiroptera	Phyllostomidae	Choeronycteris mexicana	Murcielaguito orejas de mula de Townsend		X			VAG, STEP, HUA
Chiroptera	Vespertilionidae	Lasiurus borealis	Murciélago rojizo		X			VAG
Chiroptera	Vespertilionidae	Lasiurus cinereus	Murciélago plateado		X			VAG
Chiroptera	Vespertilionidae	Lasiurus ega	Murciélago amarillo		X			VAG
Chiroptera	Vespertilionidae	Lasiurus intermedius	Murciélago amarillo	X				VAG
Chiroptera	Vespertilionidae	Myotis californicus	Murcielaguito	X				VAG
Chiroptera	Vespertilionidae	Myotis thysanodes	Murcielaguito azteca	X				VAG
Chiroptera	Vespertilionidae	Myotis velifer	Murcielaguito de las cuevas	X				VAG
Chiroptera	Vespertilionidae	Myotis yumanensis	Murcielaguito pardo	X				VAG
Chiroptera	Molossidae	Tadarida brasiliensis	Murciélago guanero			X		VAG, LLA, HUA
Carnívora	Canidae	Canis latrans	Coyote			X		ALL

Wealth, distribution and relative abundance of mammals in Aguascalientes								
ORDEN	FAMILY	SCIENTIFIC NAME	COMMON NAME	RELATIVE ABUNDANCE				
				RARE	LESS COMMON	COMMON	ABUNDANT	ECOGEOGRAPHIC ZONE
Carnívora	Canidae	Urocyon cinereoargenteus	Zorra gris		X			FRÍA, PINA, VAG, HUA
Carnívora	Felidae	Lynx rufus	Gato montés		X			FRÍA, VAG, HUA, SAB
Carnívora	Felidae	Puma concolor	Puma		X			FRÍA, MUE, VAG, HUA
Carnívora	Mustelidae	Mustela frenata	Oncita o comadreja	X				VAG, LLA
Carnívora	Mustelidae	Taxidea taxus	Tejón o Tlalcoyote	X				LLA
Carnívora	Mephitidae	Mephitis macroura	Zorrillo listado				X	VAG, STEP, LLA, HUA
Chiroptera	Phyllostomidae	Choeronycteris mexicana	Zorrillo trompa de cerdo	X				LLA, HUA
Carnívora	Mephitidae	Spilogale gracilis	Zorrillo pigmeo	X				FRÍA, ZSA, STEP
Carnívora	Procyonidae	Bassariscus astutus	Cacomixtle			X		FRÍA, PINA, HUA
Carnívora	Procyonidae	Nasua narica	Coatí o solitario				X	FRÍA, PINA, LAU, HUA
Carnívora	Procyonidae	Procyon lotor	Mapache				X	ALL
Artiodactyla	Cervidae	Odocoileus virginianus	Venado cola blanca			X		FRÍA, PINA, MONT, LAU, MUE, GUA, LLA, HUA, VEN, CAL
Artiodactyla	Tayassuidae	Tayassu tajacu	Jabalí de collar		X			FRÍA, PINA, MONT, HUA

Wealth, distribution and relative abundance of mammals in Aguascalientes								
ORDEN	FAMILY	SCIENTIFIC NAME	COMMON NAME	RELATIVE ABUNDANCE				
				RARE	LESS COMMON	COMMON	ABUNDANT	ECOGEOGRAPHIC ZONE
Rodentia	Sciuridae	Sciurus nayaritensis	Ardilla nayarita		X			FRÍA, GUA
Rodentia	Sciuridae	Spermophilus mexicanus	Ardilla terrestre		X			GUA, STEP, HUA
Rodentia	Sciuridae	Spermophilus spilosoma	Ardilla terrestre	X				LLA
Rodentia	Sciuridae	Spermophilus variegatus	Ardillón o Tachalote				X	ALL
Rodentia	Geomyidae	Thomomys umbrinus	Tuza					FRÍA, PINA, MONT, STEP
Rodentia	Heteromyidae	Dipodomys merriami	Rata canguro de Merriam			X	X	VAG, ZSA, STEP, LLA
Rodentia	Heteromyidae	Dipodomys phillipsii	Rata canguro de Philips	X				VAG, GAL
Rodentia	Heteromyidae	Dipodomys ordii	Rata canguro	X				ZSA, LLA
Rodentia	Heteromyidae	Dipodomys spectabilis	Rata canguro	X				VAG
Rodentia	Heteromyidae	Liomys irroratus	Ratón híspido mexicano			X		VAG, ZSA, STEP, LLA
Rodentia	Heteromyidae	Chaetodipus hispidus	Ratón bolsudo híspido			X		VAG, LLA, HUA
Rodentia	Heteromyidae	Chaetodipus nelsoni	Ratón bolsudo de Nelson				X	MUE, VAG, ZSA, STEP, LLA, HUA
Rodentia	Heteromyidae	Chaetodipus eremicus	Ratón bolsudo peniciliado			X		VAG, ZSA, STEP
Rodentia	Heteromyidae	Perognathus flavus	Ratón bolsudo sedoso		X			VAG, ZSA, LLA, HUA, SAB
Rodentia	Cricetidae	Microtus mexicanus	Meteorito	X				FRÍA, VAG

Wealth, distribution and relative abundance of mammals in Aguascalientes								
ORDEN	FAMILY	SCIENTIFIC NAME	COMMON NAME	RELATIVE ABUNDANCE				
				RARE	LESS COMMON	COMMON	ABUNDANT	ECOGEOGRAPHIC ZONE
Rodentia	Cricetidae	Baiomys taylori	Ratón pigmeo		X			ZSA, STEP
Rodentia	Cricetidae	Nelsonia neotomodon	Rata	X				FRÍA
Rodentia	Cricetidae	Neotoma leucodon	Rata magueyera		X			VAG, ZSA, STEP, HUA
Chiroptera	Vespertilionidae	Myotis yumanensis	Rata magueyera mexicana	X				FRÍA, LAU
Rodentia	Cricetidae	Onychomys arenicola	Ratón insectívoro		X			ZSA, LLA
Rodentia	Cricetidae	Peromyscus boylii	Ratón de patas blancas		X			HUA
Rodentia	Cricetidae	Peromyscus difficilis	Ratón de patas blancas				X	FRÍA, VAG, ZSA, STEP, HUA, LLA
Rodentia	Cricetidae	Peromyscus maniculatus	Ratón de patas blancas				X	FRÍA, VAG, ZSA, STEP, HUA, LLA
Rodentia	Cricetidae	Peromyscus melanophrys	Ratón de patas blancas			X		ZSA, STEP, LLA, HUA
Rodentia	Cricetidae	Peromyscus melanotis	Ratón de patas blancas	X				VAG
Rodentia	Cricetidae	Peromyscus pectoralis	Ratón de patas blancas		X			VAG, ZSA, STEP, HUA
Rodentia	Cricetidae	Peromyscus gratus	Ratón de patas blancas		X			VAG
Rodentia	Cricetidae	Reithrodontomys fulvescens	Ratón de las cosechas			X		ZSA, STEP, LLA, HUA
Rodentia	Cricetidae	Reithrodontomys megalotis	Ratón de las cosechas		X			VAG, JGR

Wealth, distribution and relative abundance of mammals in Aguascalientes								
ORDEN	FAMILY	SCIENTIFIC NAME	COMMON NAME	RELATIVE ABUNDANCE				
				RARE	LESS COMMON	COMMON	ABUNDANT	ECOGEOGRAPHIC ZONE
Rodentia	Cricetidae	Reithrodontomys zacatecae	Ratón de las cosechas	X				VAG
Rodentia	Cricetidae	Sigmodon hispidus	Rata del algodón		X			FRÍA, VAG, ZSA, STEP, HUA, LLA
Rodentia	Cricetidae	Sigmodon fulviventer	Rata del algodón	X				FRÍA
Rodentia	Cricetidae	Sigmodon leucotis	Rata del algodón	X				FRÍA
Lagomorpha	Leporidae	Lepus californicus	Liebre de cola negra				X	TODAS
Lagomorpha	Leporidae	Lepus callotis	Liebre de panza blanca		X			LLA
Lagomorpha	Leporidae	Sylvilagus audubonii	Conejo de cola blanca				X	ALL
Lagomorpha	Leporidae	Sylvilagus floridanus	Conejo		X			FRÍA

Anexo III. Riqueza y distribución de Aves

WEALTH AND DISTRIBUTON OF BIRDS IN AGUASCALIENTES																		
Orden	Family	Scientific name	Common name	Residence	NOM-059	Endemism	UICN	Vulnerability	Observated individuals per municipality								
									Ag	As	Ca	El	Je	Pa	Ri	Sa	Te
Accipitriformes	Accipitridae	Accipiter cooperii	Gavilán de Cooper	MI,R	Pr	ne	LC	8	19	0	0	0	0	11	3	3	7
Accipitriformes	Accipitridae	Accipiter striatus	Gavilán Pecho Canela	MI,R	Pr	ne	LC	7	20	0	2	3	1	2	0	6	3
Accipitriformes	Accipitridae	Aquila chrysaetos	Águila Real	MI,R	A	ne	LC	10	5	0	1	1	0	0	1	4	0
Accipitriformes	Accipitridae	Buteo albonotatus	Aguililla Aura	MI,MV,R	Pr	ne	LC	10	0	0	2	0	0	0	0	10	0
Accipitriformes	Accipitridae	Buteo jamaicensis	Aguililla Cola Roja	R,MI	sc	ne	LC	6	32	0	11	3	20	14	10	69	14
Accipitriformes	Accipitridae	Buteo lineatus	Aguililla Pecho Rojo	MI,R	Pr	ne	LC	8	0	0	0	0	2	0	0	0	1
Accipitriformes	Accipitridae	Buteo plagiatus	Aguililla Gris	R	sc	ne	LC	8	1	0	0	0	0	0	1	0	2
Accipitriformes	Accipitridae	Buteo swainsoni	Aguililla de Swainson	T,MV	Pr	ne	LC	12	0	0	0	0	0	2	0	0	0
Accipitriformes	Accipitridae	Circus cyaneus	Gavilán Rastrero	MI,R	sc	ne	LC	11	4	0	0	4	1	3	0	6	18
Accipitriformes	Accipitridae	Elanus leucurus	Milano Cola Blanca	R	sc	ne	LC	8	24	0	0	0	7	2	0	3	29
Accipitriformes	Accipitridae	Geranoaetus albicaudatus	Aguililla Cola Blanca	R	Pr	ne	LC	10	0	0	0	0	0	0	0	0	1
Accipitriformes	Accipitridae	Parabuteo unicinctus	Aguililla Rojinegra	R	Pr	ne	LC	11	6	0	2	0	2	4	0	5	0
Accipitriformes	Pandionidae	Pandion haliaetus	Águila Pescadora	MI,R	sc	ne	LC	7	5	0	0	0	3	0	1	1	0
Anseriformes	Anatidae	Aix sponsa	Pato Arcoíris	MI	sc	ne	LC	8	1	0	0	0	0	0	0	2	0
Anseriformes	Anatidae	Anas acuta	Pato Golondrino	MI	sc	ne	LC	11	9	0	0	93	0	0	22	109	0
Anseriformes	Anatidae	Anas americana	Pato Chalcuán	MI	sc	ne	LC	9	83	0	0	3	5	0	5	650	2

WEALTH AND DISTRIBUTON OF BIRDS IN AGUASCALIENTES																	
Orden	Family	Scientific name	Common name	Residence	NOM-059	Endemism	UICN	Vulnerability	Observated individuals per municipality								
									Ag	As	Ca	El	Je	Pa	Ri	Sa	Te
Anseriformes	Anatidae	Anas clypeata	Pato Cucharón Norteño	MI	sc	ne	LC	7	1020	20	0	260	17	56	32	4766	32
Anseriformes	Anatidae	Anas crecca	Cerceta Alas Verdes	MI	sc	ne	LC	6	142	0	0	80	4	15	17	101	8
Anseriformes	Anatidae	Anas cyanoptera	Cerceta Canela	MI,R	sc	ne	LC	10	140	0	0	48	33	0	16	129	0
Anseriformes	Anatidae	Anas discors	Cerceta Alas Azules	MI	sc	ne	LC	8	168	20	0	30	8	0	0	32	0
Anseriformes	Anatidae	Anas platyrhynchos	Pato de Collar	MI,R	sc	ne	LC	7	1147	0	42	132	22	58	38	201	219
Anseriformes	Anatidae	Anas strepera	Pato Friso	MI	sc	ne	LC	8	219	0	3	0	2	23	10	154	20
Anseriformes	Anatidae	Anser albifrons	Ganso Careto Mayor	MI	sc	ne	LC	10	0	0	0	64	0	0	0	0	0
Anseriformes	Anatidae	Aythya affinis	Pato Boludo Menor	MI	sc	ne	LC	12	58	0	0	0	0	1	0	70	0
Anseriformes	Anatidae	Aythya americana	Pato Cabeza Roja	MI,R	sc	ne	LC	10	19	0	0	0	0	0	0	6	0
Anseriformes	Anatidae	Aythya collaris	Pato Pico Anillado	MI	sc	ne	LC	8	64	2	0	0	23	0	0	14	0
Anseriformes	Anatidae	Aythya valisineria	Pato Coacoxtle	MI	sc	ne	LC	10	58	0	0	0	0	0	0	30	0
Anseriformes	Anatidae	Bucephala albeola	Pato Monja	MI	sc	ne	LC	8	17	2	0	1	11	0	6	636	0
Anseriformes	Anatidae	Dendrocygna autumnalis	Pijije Alas Blancas	R	sc	ne	LC	8	0	0	0	0	0	0	0	0	0
Anseriformes	Anatidae	Oxyura jamaicensis	Pato Tepalcate	MI,R	sc	ne	LC	8	610	0	21	11	25	9	18	577	0
Apodiformes	Apodidae	Aeronautes saxatalis	Vencejo Pecho Blanco	R	sc	ne	LC	11	40	0	11	0	51	25	38	130	12
Apodiformes	Apodidae	Chaetura vauxi	Vencejo de Vaux	R,T	sc	ne	LC	11	0	0	0	0	0	1	0	0	0
Apodiformes	Trochilidae	Amazilia beryllina	Colibrí Berilo	R	sc	ne	LC	10	3	0	2	0	0	1	0	0	0
Apodiformes	Trochilidae	Amazilia violiceps	Colibrí Corona Violeta	R	sc	SE	LC	10	31	0	3	0	9	1	3	9	0

WEALTH AND DISTRIBUTON OF BIRDS IN AGUASCALIENTES																		
Orden	Family	Scientific name	Common name	Residence	NOM-059	Endemism	UICN	Vulnerability	Observated individuals per municipality									
									Ag	As	Ca	El	Je	Pa	Ri	Sa	Te
Apodiformes	Trochilidae	Archilochus alexandri	Colibrí Barba Negra	MV,MI	sc	SE	LC	11	8	0	2	0	0	0	1	0	0
Apodiformes	Trochilidae	Archilochus colubris	Colibrí Garganta Rubí	MI,T	sc	ne	LC	8	0	0	1	0	2	0	0	2	0
Apodiformes	Trochilidae	Calothorax lucifer	Colibrí Lucifer	MV,MI,R	sc	SE	LC	14	1	0	1	0	0	0	0	0	0
Apodiformes	Trochilidae	Cynanthus latirostris	Colibrí Pico Ancho	R	sc	SE	LC	10	247	0	23	3	40	58	8	46	3
Apodiformes	Trochilidae	Eugenes fulgens	Colibrí Magnífico	R	sc	ne	LC	12	14	0	4	0	0	0	1	0	0
Apodiformes	Trochilidae	Hylocharis leucotis	Zafiro Orejas Blancas	R	sc	ne	LC	11	10	0	10	0	0	0	2	1	0
Apodiformes	Trochilidae	Lampornis clemenciae	Colibrí Garganta Azul	R	sc	SE	LC	12	1	0	11	0	0	0	0	0	0
Apodiformes	Trochilidae	Selasphorus calliope	Zumbador Garganta Rayada	MI,MV	sc	SE	LC	11	3	0	3	0	0	0	0	0	0
Apodiformes	Trochilidae	Selasphorus platycercus	Zumbador Cola Ancha	R,MI,MV	sc	SE	LC	10	2	0	1	0	0	2	0	0	0
Apodiformes	Trochilidae	Selasphorus rufus	Zumbador Canelo	MI	sc	ne	LC	13	0	0	4	0	10	0	0	2	0
Caprimulgiformes	Caprimulgidae	Antrostomus arizonae	Tapacaminos Cuerporruín Mexicano	R,MV	sc	ne	LC	14	0	0	0	0	0	2	0	0	0
Caprimulgiformes	Caprimulgidae	Antrostomus ridgwayi	Tapacaminos Tucuchillo	R,MV	sc	ne	LC	12	0	0	0	0	0	6	0	0	0
Caprimulgiformes	Caprimulgidae	Chordeiles acutipennis	Chotacabras Menor	MV,MI,R	sc	ne	LC	8	2	0	0	0	1	1	0	5	0
Caprimulgiformes	Caprimulgidae	Chordeiles minor	Chotacabras Zumbón	MV,T	sc	ne	LC	11	0	0	0	0	3	0	0	1	0
Cathartiformes	Cathartidae	Cathartes aura	Zopilote Aura	R	sc	ne	LC	5	275	0	51	25	75	156	88	391	102
Cathartiformes	Cathartidae	Coragyps atratus	Zopilote Común	R	sc	ne	LC	5	158	0	25	2	68	68	103	121	19
Charadriiformes	Charadriidae	Charadrius vociferus	Chorlo Tildío	R,MI	sc	ne	LC	9	218	0	0	57	23	5	0	60	29

WEALTH AND DISTRIBUTON OF BIRDS IN AGUASCALIENTES																		
Orden	Family	Scientific name	Common name	Residence	NOM-059	Endemism	UICN	Vulnerability	Observated individuals per municipality									
									Ag	As	Ca	El	Je	Pa	Ri	Sa	Te
Charadriiformes	Jacanidae	Jacana spinosa	Jacana Norteña	R	sc	ne	LC	11	0	0	0	0	0	0	0	0	0
Charadriiformes	Laridae	Larus delawarensis	Gaviota Pico Anillado	MI	sc	ne	LC	6	0	0	0	0	35	0	0	176	0
Charadriiformes	Laridae	Leucophaeus atricilla	Gaviota Reidora	MI,R	sc	ne	LC	8	0	0	0	0	0	0	0	0	0
Charadriiformes	Recurvirostridae	Himantopus mexicanus	Monjita Americana	R,MI	sc	ne	LC	11	585	1	0	51	0	10	43	0	28
Charadriiformes	Recurvirostridae	Recurvirostra americana	Avoceta Americana	MI,R	sc	ne	LC	12	43	0	0	131	0	0	8	2	5
Charadriiformes	Scolopacidae	Actitis macularius	Playero Alzacolita	MI	sc	ne	LC	9	201	0	0	8	46	2	8	29	1
Charadriiformes	Scolopacidae	Bartramia longicauda	Zarapito Ganga	T	sc	ne	LC	13	95	0	0	0	0	4	0	0	0
Charadriiformes	Scolopacidae	Calidris bairdii	Playero de Baird	T	sc	ne	LC	12	0	0	0	55	0	0	0	0	0
Charadriiformes	Scolopacidae	Calidris himantopus	Playero Zancón	MI,T	sc	ne	LC	15	0	0	0	1	0	0	0	0	0
Charadriiformes	Scolopacidae	Calidris mauri	Playero Occidental	MI,T	sc	ne	LC	15	2	0	0	116	0	0	0	0	0
Charadriiformes	Scolopacidae	Calidris minutilla	Playero Diminuto	MI	sc	ne	LC	11	99	0	0	385	0	12	17	30	0
Charadriiformes	Scolopacidae	Gallinago delicata	Agachona Norteamericana	MI	sc	ne	LC	11	8	0	0	0	0	0	0	1	0
Charadriiformes	Scolopacidae	Limnodromus scolopaceus	Costurero Pico Largo	MI	sc	ne	LC	12	231	0	0	373	1	15	31	20	9
Charadriiformes	Scolopacidae	Numenius americanus	Zarapito Pico Largo	MI	sc	ne	LC	15	1401	0	0	234	23	0	3	0	57
Charadriiformes	Scolopacidae	Phalaropus tricolor	Falaropo Pico Largo	T,MI	sc	ne	LC	11	0	0	0	2	0	0	0	18	0
Charadriiformes	Scolopacidae	Tringa flavipes	Patamarilla Menor	MI	sc	ne	LC	12	5	0	0	46	0	0	0	0	0
Charadriiformes	Scolopacidae	Tringa melanoleuca	Patamarilla Mayor	MI	sc	ne	LC	10	12	0	0	6	1	0	0	2	0

WEALTH AND DISTRIBUTON OF BIRDS IN AGUASCALIENTES																	
Orden	Family	Scientific name	Common name	Residence	NOM-059	Endemism	UICN	Vulnerability	Observated individuals per municipality								
									Ag	As	Ca	El	Je	Pa	Ri	Sa	Te
Charadriiformes	Jacanidae	Jacana spinosa	Jacana Norteña	R	sc	ne	LC	11	0	0	0	0	0	0	0	0	0
Charadriiformes	Laridae	Larus delawarensis	Gaviota Pico Anillado	MI	sc	ne	LC	6	0	0	0	0	35	0	0	176	0
Charadriiformes	Laridae	Leucophaeus atricilla	Gaviota Reidora	MI,R	sc	ne	LC	8	0	0	0	0	0	0	0	0	0
Charadriiformes	Recurvirostridae	Himantopus mexicanus	Monjita Americana	R,MI	sc	ne	LC	11	585	1	0	51	0	10	43	0	28
Charadriiformes	Recurvirostridae	Recurvirostra americana	Avoceta Americana	MI,R	sc	ne	LC	12	43	0	0	131	0	0	8	2	5
Charadriiformes	Scolopacidae	Actitis macularius	Playero Alzacolita	MI	sc	ne	LC	9	201	0	0	8	46	2	8	29	1
Charadriiformes	Scolopacidae	Bartramia longicauda	Zarapito Ganga	T	sc	ne	LC	13	95	0	0	0	0	4	0	0	0
Charadriiformes	Scolopacidae	Calidris bairdii	Playero de Baird	T	sc	ne	LC	12	0	0	0	55	0	0	0	0	0
Charadriiformes	Scolopacidae	Calidris himantopus	Playero Zancón	MI,T	sc	ne	LC	15	0	0	0	1	0	0	0	0	0
Charadriiformes	Scolopacidae	Calidris mauri	Playero Occidental	MI,T	sc	ne	LC	15	2	0	0	116	0	0	0	0	0
Charadriiformes	Scolopacidae	Calidris minutilla	Playero Diminuto	MI	sc	ne	LC	11	99	0	0	385	0	12	17	30	0
Charadriiformes	Scolopacidae	Gallinago delicata	Agachona Norteamericana	MI	sc	ne	LC	11	8	0	0	0	0	0	0	1	0
Charadriiformes	Scolopacidae	Limnodromus scolopaceus	Costurero Pico Largo	MI	sc	ne	LC	12	231	0	0	373	1	15	31	20	9
Charadriiformes	Scolopacidae	Numenius americanus	Zarapito Pico Largo	MI	sc	ne	LC	15	1401	0	0	234	23	0	3	0	57
Charadriiformes	Scolopacidae	Phalaropus tricolor	Falaropo Pico Largo	T,MI	sc	ne	LC	11	0	0	0	2	0	0	0	18	0
Charadriiformes	Scolopacidae	Tringa flavipes	Patamarilla Menor	MI	sc	ne	LC	12	5	0	0	46	0	0	0	0	0
Charadriiformes	Scolopacidae	Tringa melanoleuca	Patamarilla Mayor	MI	sc	ne	LC	10	12	0	0	6	1	0	0	2	0

WEALTH AND DISTRIBUTON OF BIRDS IN AGUASCALIENTES																		
Orden	Family	Scientific name	Common name	Residence	NOM-059	Endemism	UICN	Vulnerability	Observated individuals per municipality									
									Ag	As	Ca	El	Je	Pa	Ri	Sa	Te
Charadriiformes	Scolopacidae	Tringa solitaria	Playero Solitario	MI	sc	ne	LC	12	3	0	0	0	0	0	0	0	0
Columbiformes	Columbidae	Columba livia	Paloma Doméstica	R	sc	Exo	LC	6	511	0	5	0	28	252	0	66	124
Columbiformes	Columbidae	Columbina inca	Tortolita Cola Larga	R	sc	ne	LC	8	1665	0	36	64	153	460	24	263	150
Columbiformes	Columbidae	Columbina passerina	Tortolita Pico Rojo	R	sc	ne	LC	9	6	0	0	0	0	0	0	2	6
Columbiformes	Columbidae	Leptotila verreauxi	Paloma Arroyera	R	sc	ne	LC	8	3	0	6	0	0	0	0	0	0
Columbiformes	Columbidae	Patagioenas fasciata	Paloma Encinera	R,MI	sc	ne	LC	12	0	0	35	0	5	0	0	5	0
Columbiformes	Columbidae	Streptopelia decaocto	Paloma de Collar Turca	R	sc	Exo	LC	5	6	0	0	0	4	76	0	14	2
Columbiformes	Columbidae	Zenaida asiatica	Paloma Alas Blancas	R,MI	sc	ne	LC	8	1838	5	29	17	189	677	67	399	453
Columbiformes	Columbidae	Zenaida macroura	Huilota Común	R,MI	sc	ne	LC	5	1024	1	20	16	83	305	9	73	341
Coraciiformes	Alcedinidae	Chloroceryle americana	Martín Pescador Verde	R	sc	ne	LC	10	4	0	0	0	0	0	1	0	0
Coraciiformes	Alcedinidae	Megaceryle alcyon	Martín Pescador Norteño	MI	sc	ne	LC	11	19	0	0	0	1	1	0	4	0
Cuculiformes	Cuculidae	Coccyzus americanus	Cuclillo Pico Amarillo	MV,T	sc	ne	LC	12	1	0	4	0	0	1	0	1	0
Cuculiformes	Cuculidae	Crotophaga sulcirostris	Garrapatero Pijuy	R	sc	ne	LC	7	143	0	3	0	6	26	0	2	0
Cuculiformes	Cuculidae	Geococcyx californianus	Correcaminos Norteño	R	sc	ne	LC	9	18	0	9	0	2	0	0	13	1
Falconiformes	Falconidae	Caracara cheriway	Caracara Quebrantahuesos	R	sc	ne	LC	8	83	1	2	11	31	23	4	48	94
Falconiformes	Falconidae	Falco columbarius	Halcón Esmerejón	MI	sc	ne	LC	7	1	0	0	0	1	1	0	1	0

WEALTH AND DISTRIBUTON OF BIRDS IN AGUASCALIENTES																	
Orden	Family	Scientific name	Common name	Residence	NOM-059	Endemism	UICN	Vulnerability	Observated individuals per municipality								
									Ag	As	Ca	El	Je	Pa	Ri	Sa	Te
Falconiformes	Falconidae	Falco mexicanus	Halcón Mexicano	R,MI	A	ne	LC	10	0	0	0	0	0	0	0	0	0
Falconiformes	Falconidae	Falco peregrinus	Halcón Peregrino	R,MI	Pr	ne	LC	9	12	0	0	1	2	0	2	2	3
Falconiformes	Falconidae	Falco sparverius	Cernícalo Americano	R,MI	sc	ne	LC	11	66	0	5	10	4	8	3	41	36
Galliformes	Odontophoridae	Callipepla squamata	Codorniz Escamosa	R	sc	ne	LC	9	64	0	0	0	0	0	0	0	0
Galliformes	Odontophoridae	Colinus virginianus	Codorniz Cotuí	R	sc	ne	NT	11	18	0	0	0	5	3	0	2	3
Galliformes	Odontophoridae	Cyrtonyx montezumae	Codorniz de Moctezuma	R	Pr	ne	LC	13	0	0	16	0	0	0	0	42	0
Galliformes	Phasianidae	Meleagris gallopavo	Guajolote Norteño	R	sc	ne	LC	7	0	0	0	0	4	0	0	31	0
Gruiformes	Rallidae	Fulica americana	Gallareta Americana	R,MI	sc	ne	LC	11	1131	20	23	21	87	67	2068	8101	2
Gruiformes	Rallidae	Gallinula galeata	Gallineta Frente Roja	R,MI	sc	ne	LC	8	6	0	0	0	0	1	0	19	1
Gruiformes	Rallidae	Porzana carolina	Polluela Sora	MI,R	sc	ne	LC	10	0	0	0	0	0	0	0	5	0
Passeriformes	Aegithalidae	Psaltriparus minimus	Sastrecillo	R	sc	ne	LC	11	400	0	155	12	50	6	3	148	0
Passeriformes	Alaudidae	Eremophila alpestris	Alondra Cornuda	R	sc	ne	LC	9	0	0	0	40	0	1	0	2	0
Passeriformes	Bombycillidae	Bombycilla cedrorum	Chinito	MI	sc	ne	LC	6	36	0	0	0	0	166	0	0	10
Passeriformes	Calcariidae	Calcarius ornatus	Escribano Collar Castaño	MI	sc	ne	NT	14	0	0	0	12	0	0	0	0	0
Passeriformes	Cardinalidae	Cardinalis cardinalis	Cardenal Rojo	R	sc	ne	LC	5	19	0	3	1	0	0	1	0	0
Passeriformes	Cardinalidae	Cardinalis sinuatus	Cardenal Desértico	R	sc	ne	LC	12	10	0	5	1	4	0	0	8	4
Passeriformes	Cardinalidae	Passerina amoena	Colorín Pecho Canela	MI,MV	sc	SE	LC	9	0	0	0	0	0	0	0	0	0

WEALTH AND DISTRIBUTON OF BIRDS IN AGUASCALIENTES																		
Orden	Family	Scientific name	Common name	Residence	NOM-059	Endemism	UICN	Vulnerability	Observated individuals per municipality									
									Ag	As	Ca	El	Je	Pa	Ri	Sa	Te
Passeriformes	Cardinalidae	Passerina caerulea	Picogordo Azul	MI,R,MV	sc	ne	LC	8	124	0	36	1	50	10	5	58	75
Passeriformes	Cardinalidae	Passerina ciris	Colorín Sietecolores	MI,MV	Pr	ne	NT	12	2	0	0	0	0	0	0	0	0
Passeriformes	Cardinalidae	Passerina versicolor	Colorín Morado	R,MV	sc	ne	LC	13	17	0	10	0	0	1	1	0	2
Passeriformes	Cardinalidae	Pheucticus melanocephalus	Picogordo Tigrillo	R,MI,MV	sc	SE	LC	9	1	0	53	1	0	0	2	22	0
Passeriformes	Cardinalidae	Piranga bidentata	Piranga Dorso Rayado	R	sc	ne	LC	14	0	0	2	0	0	0	1	0	0
Passeriformes	Cardinalidae	Piranga flava	Piranga Encinera	R	sc	ne	LC	8	0	0	25	0	8	0	1	10	0
Passeriformes	Cardinalidae	Piranga ludoviciana	Piranga Capucha Roja	MI	sc	ne	LC	8	14	0	0	0	0	1	1	1	0
Passeriformes	Cardinalidae	Piranga rubra	Piranga Roja	MI,MV	sc	ne	LC	9	7	0	0	0	0	5	0	1	0
Passeriformes	Certhiidae	Certhia americana	Trepadorcito Americano	R,MI	sc	ne	LC	8	0	0	2	0	0	0	0	4	0
Passeriformes	Corvidae	Aphelocoma californica	Chara Californiana	R	sc	ne	LC	9	0	0	1	2	0	1	0	2	0
Passeriformes	Corvidae	Aphelocoma ultramarina	Chara Transvolcánica	R	sc	EN	LC		0	0	64	0	0	0	0	81	0
Passeriformes	Corvidae	Aphelocoma wollweberi	Chara Pecho Gris	R	sc	ne	LC	12	0	0	194	2	1	0	0	203	0
Passeriformes	Corvidae	Corvus corax	Cuervo Común	R	sc	ne	LC	6	89	0	88	90	63	78	27	261	209
Passeriformes	Corvidae	Corvus cryptoleucus	Cuervo Llanero	R,MI	sc	ne	LC	10	18	1	6	21	5	27	1	46	740
Passeriformes	Emberizidae	Aimophila ruficeps	Zacatonero Corona Canela	R	sc	ne	LC	11	0	0	21	8	20	0	0	1	0
Passeriformes	Emberizidae	Ammodramus savannarum	Gorrión Chapulín	MI,R	sc	ne	LC	12	4	0	0	0	0	0	0	5	0
Passeriformes	Emberizidae	Amphispiza bilineata	Zacatonero Garganta Negra	R	sc	ne	LC	9	0	0	0	8	0	0	0	0	0

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Passeriformes	Emberizidae	Calamospiza melanocorys	Gorrión Alas Blancas	MI	sc	ne	LC	12	3	0	0	0	0	0	0	0	0
Passeriformes	Emberizidae	Chondestes grammacus	Gorrión Arlequín	MI,R	sc	ne	LC	10	187	0	1	61	65	44	0	180	124
Passeriformes	Emberizidae	Junco phaeonotus	Junco Ojos de Lumbre	R	sc	CE	LC	9	0	0	182	0	0	0	0	147	0
Passeriformes	Emberizidae	Melospiza georgiana	Gorrión Pantanero	MI	sc	ne	LC	6	0	0	0	0	0	0	0	0	0
Passeriformes	Emberizidae	Melospiza lincolnii	Gorrión de Lincoln	MI	sc	ne	LC	7	40	0	0	0	10	0	0	23	0
Passeriformes	Emberizidae	Melozone fusca	Rascador Viejita	R	sc	ne	LC	9	263	0	66	17	92	66	5	120	122
Passeriformes	Emberizidae	Passerculus sandwichensis	Gorrión Sabanero	MI,R	sc	ne	LC	8	30	0	0	32	13	0	0	7	0
Passeriformes	Emberizidae	Peucaea cassinii	Zacatonero de Cassin	R,MI	sc	ne	LC	11	0	0	0	0	0	0	0	1	0
Passeriformes	Emberizidae	Pipilo chlorurus	Rascador Cola Verde	MI,R	sc	ne	LC	10	3	0	0	0	2	0	0	3	2
Passeriformes	Emberizidae	Pipilo maculatus	Rascador Moteado	R,MI	sc	ne	LC	8	0	0	35	0	0	0	1	46	0
Passeriformes	Emberizidae	Pooecetes gramineus	Gorrión Cola Blanca	MI	sc	ne	LC	11	16	0	0	13	6	0	0	18	0
Passeriformes	Emberizidae	Spizella atrogularis	Gorrión Barba Negra	R,MI	sc	ne	LC	15	0	0	3	3	0	0	0	0	0
Passeriformes	Emberizidae	Spizella breweri	Gorrión de Brewer	MI	sc	ne	LC	12	0	0	0	0	1	0	0	0	0
Passeriformes	Emberizidae	Spizella pallida	Gorrión Pálido	MI	sc	SE	LC	10	195	0	0	1	12	0	0	50	10
Passeriformes	Emberizidae	Spizella passerina	Gorrión Cejas Blancas	R,MI	sc	ne	LC	8	331	0	22	38	84	79	3	175	198
Passeriformes	Emberizidae	Zonotrichia leucophrys	Gorrión Corona Blanca	MI	sc	ne	LC	7	2	0	0	0	0	2	0	3	17
Passeriformes	Fringillidae	Haemorhous mexicanus	Pinzón Mexicano	R	sc	ne	LC	6	1085	0	78	35	49	293	27	132	53

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Passeriformes	Fringillidae	Spinus pinus	Jilguerito Pinero	R,MI	sc	ne	LC	10	0	0	7	0	0	0	0	0	1
Passeriformes	Fringillidae	Spinus psaltria	Jilguerito Dominico	R	sc	ne	LC	8	745	0	134	24	86	390	5	194	122
Passeriformes	Hirundinidae	Hirundo rustica	Golondrina Tijereta	MV,MI,R,T	sc	ne	LC	8	991	5	62	941	200	362	33	413	326
Passeriformes	Hirundinidae	Petrochelidon pyrrhonota	Golondrina Risquera	MV,T	sc	ne	LC	7	27	0	27	5	1	80	27	139	0
Passeriformes	Hirundinidae	Progne subis	Golondrina Azulnegra	T,MV	sc	ne	LC	8	0	0	5	0	0	0	0	0	0
Passeriformes	Hirundinidae	Riparia riparia	Golondrina Ribereña	T,MI,MV	sc	ne	LC	10	1	0	0	0	0	0	0	0	0
Passeriformes	Hirundinidae	Stelgidopteryx serripennis	Golondrina Alas Aserradas	R,MI	sc	ne	LC	9	62	0	28	1	8	0	13	10	9
Passeriformes	Hirundinidae	Tachycineta bicolor	Golondrina Bicolor	MI	sc	ne	LC	8	3	20	4	15	79	0	0	204	0
Passeriformes	Hirundinidae	Tachycineta thalassina	Golondrina Verdemar	R,MI	sc	ne	LC	8	0	0	21	0	1	8	25	50	30
Passeriformes	Icteridae	Agelaius phoeniceus	Tordo Sargento	R,MI	sc	ne	LC	8	0	0	0	0	0	0	0	0	23
Passeriformes	Icteridae	Euphagus cyanocephalus	Tordo Ojos Amarillos	MI,R	sc	ne	LC	9	103	0	0	1	0	0	0	2	78
Passeriformes	Icteridae	Icterus abeillei	Calandria Flancos Negros	R,MI	sc	EN	LC	14	38	0	0	2	1	9	0	0	0
Passeriformes	Icteridae	Icterus bullockii	Calandria Cejas Naranjas	MI,MV	sc	SE	LC	11	30	0	15	0	0	11	1	4	2
Passeriformes	Icteridae	Icterus cucullatus	Calandria Dorso Negro Menor	MI,MV,R	sc	SE	LC	10	11	0	2	0	3	3	0	0	0
Passeriformes	Icteridae	Icterus parisorum	Calandria Tunera	R,MV,MI	sc	SE	LC	11	1	0	8	2	8	1	0	12	0
Passeriformes	Icteridae	Icterus pustulatus	Calandria Dorso Rayado	R	sc	ne	LC	10	0	0	1	0	0	0	0	0	0

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Passeriformes	Icteridae	Icterus spurius	Calandria Castaña	MI,MV	sc	ne	LC	9	6	0	0	0	1	0	0	2	1
Passeriformes	Icteridae	Icterus wagleri	Calandria de Wagler	R	sc	ne	LC	12	0	0	8	0	2	2	5	2	0
Passeriformes	Icteridae	Molothrus aeneus	Tordo Ojos Rojos	R,MV	sc	ne	LC	6	170	0	27	20	4	4	10	15	0
Passeriformes	Icteridae	Molothrus ater	Tordo Cabeza Café	R,MI	sc	ne	LC	7	93228	0	9	335	20	3701	400	788	206
Passeriformes	Icteridae	Quiscalus mexicanus	Zanate Mayor	R	sc	ne	LC	5	3971	0	27	31	79	1551	49	587	1018
Passeriformes	Icteridae	Sturnella magna	Pradero Tortillaconchile	R	sc	ne	LC	11	5	0	2	1	3	3	0	9	2
Passeriformes	Icteridae	Sturnella neglecta	Pradero del Oeste	R,MI	sc	ne	LC	10	0	0	0	1	0	0	0	0	0
Passeriformes	Icteridae	Xanthocephalus xanthocephalus	Tordo Cabeza Amarilla	MI	sc	ne	LC	9	44918	0	50	0	2	376	0	71	0
Passeriformes	Laniidae	Lanius ludovicianus	Verdugo Americano	R,MI	sc	ne	LC	11	69	1	3	9	21	22	4	34	72
Passeriformes	Mimidae	Melanotis caerulescens	Mulato Azul	R	sc	EN	LC	12	4	0	2	0	0	0	0	8	0
Passeriformes	Mimidae	Mimus polyglottos	Centzontle Norteño	R,MI	sc	ne	LC	8	40	0	10	17	31	20	6	33	6
Passeriformes	Mimidae	Oreoscoptes montanus	Cuicacoche Chato	MI	sc	ne	LC	11	0	0	0	2	0	0	0	0	0
Passeriformes	Mimidae	Toxostoma curvirostre	Cuicacoche Pico Curvo	R	sc	ne	LC	9	229	0	11	22	55	103	7	130	99
Passeriformes	Motacillidae	Anthus rubescens	Bisbita Norteamericana	MI	sc	ne	LC	9	47	0	0	45	0	0	0	11	0
Passeriformes	Motacillidae	Anthus spragueii	Bisbita Llanera	MI	sc	ne	VU	14	1	0	0	4	0	0	0	0	0
Passeriformes	Paridae	Baeolophus wollweberi	Carbonero Embridado	R	sc	ne	LC	12	0	0	161	0	0	0	0	86	0

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Passeriformes	Paridae	Poecile sclateri	Carbonero Mexicano	R	sc	CE	LC	14	0	0	3	0	0	0	0	0	0
Passeriformes	Parulidae	Basileuterus rufifrons	Chipe Gorra Canela	R	sc	CE	LC	12	0	0	9	0	2	0	0	3	0
Passeriformes	Parulidae	Cardellina pusilla	Chipe Corona Negra	MI	sc	ne	LC	10	84	0	4	3	2	29	15	12	4
Passeriformes	Parulidae	Cardellina rubrifrons	Chipe Cara Roja	MI,MV	sc	SE	LC	13	0	0	0	0	0	0	0	1	0
Passeriformes	Parulidae	Geothlypis tolmiei	Chipe Lores Negros	MI	A	ne	LC	11	3	0	0	1	0	0	0	2	0
Passeriformes	Parulidae	Geothlypis trichas	Mascarita Común	MI,R	sc	ne	LC	9	13	0	0	0	2	5	0	13	8
Passeriformes	Parulidae	Icteria virens	Chipe Grande	MI,MV	sc	ne	LC	9	27	0	8	0	1	0	1	2	0
Passeriformes	Parulidae	Mniotilta varia	Chipe Trepador	MI	sc	ne	LC	10	11	0	3	0	0	0	0	0	0
Passeriformes	Parulidae	Myioborus miniatus	Pavito Alas Negras	R	sc	ne	LC	11	0	0	2	0	0	0	0	0	0
Passeriformes	Parulidae	Myioborus pictus	Pavito Alas Blancas	R	sc	ne	LC	13	0	0	18	0	0	0	0	23	0
Passeriformes	Parulidae	Oreothlypis celata	Chipe Oliváceo	MI,R	sc	ne	LC	9	26	0	2	0	3	10	4	4	8
Passeriformes	Parulidae	Oreothlypis luciae	Chipe Rabadilla Castaña	MI,MV	sc	SE	LC	13	0	0	0	0	0	2	0	0	0
Passeriformes	Parulidae	Oreothlypis ruficapilla	Chipe Cabeza Gris	MI	sc	ne	LC	9	2	0	0	0	0	2	0	0	0
Passeriformes	Parulidae	Parkesia noveboracensis	Chipe Charquero	MI	sc	ne	LC	10	1	0	0	0	0	1	0	1	0
Passeriformes	Parulidae	Setophaga coronata	Chipe Rabadilla Amarilla	MI,R	sc	ne	LC	6	1130	0	9	35	99	459	6	283	235
Passeriformes	Parulidae	Setophaga dominica	Chipe Garganta Amarilla	MI	sc	ne	LC	10	0	0	0	0	0	0	0	0	0
Passeriformes	Parulidae	Setophaga graciae	Chipe Cejas Amarillas	R,MV	sc	ne	LC	13	0	0	5	0	0	0	0	1	0

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Passeriformes	Parulidae	Setophaga nigrescens	Chipe Negrogris	MI	sc	SE	LC	11	0	0	0	0	3	0	0	3	0
Passeriformes	Parulidae	Setophaga occidentalis	Chipe Cabeza Amarilla	MI	sc	ne	LC	12	4	0	0	0	0	1	0	8	0
Passeriformes	Parulidae	Setophaga petechia	Chipe Amarillo	MI,MV,T,R	sc	ne	LC	6	143	0	15	0	0	1	3	0	0
Passeriformes	Parulidae	Setophaga ruticilla	Pavito Migratorio	MI	sc	ne	LC	10	0	0	1	0	0	0	0	0	0
Passeriformes	Parulidae	Setophaga townsendi	Chipe de Townsend	MI	sc	ne	LC	10	1	0	0	0	0	0	5	9	0
Passeriformes	Passeridae	Passer domesticus	Gorrión Doméstico	R	sc	Exo	LC	8	803	0	37	0	89	652	1	183	210
Passeriformes	Peucedramidae	Peucedramus taeniatus	Ocotero Enmascarado	R	sc	ne	LC	12	0	0	4	0	0	0	0	4	0
Passeriformes	Polioptilidae	Polioptila caerulea	Perlita Azulgris	MI,R	sc	ne	LC	7	310	0	39	11	55	18	11	88	51
Passeriformes	Ptiliogonatidae	Phainopepla nitens	Capulinero Negro	MI,R	sc	ne	LC	10	4	0	9	4	15	15	12	49	6
Passeriformes	Ptiliogonatidae	Ptiliogonys cinereus	Capulinero Gris	R	sc	CE	LC	12	0	0	1	0	0	0	0	19	0
Passeriformes	Regulidae	Regulus calendula	Reyezuelo Matraquita	MI	sc	ne	LC	6	25	0	1	2	12	18	0	32	6
Passeriformes	Remizidae	Auriparus flaviceps	Baloncillo	R	sc	ne	LC	11	57	0	2	7	7	41	14	21	17
Passeriformes	Sittidae	Sitta carolinensis	Bajapalos Pecho Blanco	R	sc	ne	LC	6	0	0	63	0	0	0	0	73	0
Passeriformes	Sittidae	Sitta pygmaea	Bajapalos Enano	R	sc	ne	LC	10	0	0	10	0	0	0	0	2	0
Passeriformes	Sturnidae	Sturnus vulgaris	Estornino Pinto	R	sc	Exo	LC	7	568	0	0	0	11	12	7	138	49
Passeriformes	Thraupidae	Sporophila torqueola	Semillero de Collar	R	sc	ne	LC	6	156	0	5	0	3	20	0	26	6
Passeriformes	Thraupidae	Volatinia jacarina	Semillero Brincador	R	sc	ne	LC	4	0	0	0	0	0	0	0	0	1
Passeriformes	Tityridae	Pachyramphus aglaiae	Cabezón Degollado	R	sc	ne	LC	11	102	0	0	0	2	0	1	0	0

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Passeriformes	Troglodytidae	Campylorhynchus brunneicapillus	Matraca del Desierto	R	sc	ne	LC	10	182	3	4	30	104	37	27	109	1
Passeriformes	Troglodytidae	Campylorhynchus gularis	Matraca Serrana	R	sc	EN	LC	14	0	0	7	0	0	0	0	2	0
Passeriformes	Troglodytidae	Catherpes mexicanus	Saltapared Barranqueño	R	sc	ne	LC	11	12	0	53	0	35	8	10	66	0
Passeriformes	Troglodytidae	Cistothorus palustris	Saltapared Pantanero	MI,R	sc	ne	LC	7	1	0	0	0	0	7	0	24	5
Passeriformes	Troglodytidae	Salpinctes obsoletus	Saltapared de Rocas	R	sc	ne	LC	12	15	0	9	16	17	3	7	24	0
Passeriformes	Troglodytidae	Thryomanes bewickii	Saltapared Cola Larga	R	sc	ne	LC	10	313	0	14	20	42	67	16	96	54
Passeriformes	Troglodytidae	Troglodytes aedon	Saltapared Común	R,MI,T	sc	ne	LC	5	30	0	1	1	4	1	0	11	1
Passeriformes	Turdidae	Catharus aurantiirostris	Zorzal Pico Naranja	R,MI	sc	ne	LC	12	0	0	0	0	0	0	0	0	0
Passeriformes	Turdidae	Catharus guttatus	Zorzal Cola Canela	MI	sc	ne	LC	6	2	0	0	0	0	0	0	3	0
Passeriformes	Turdidae	Catharus occidentalis	Zorzal Mexicano	R	sc	EN	LC	14	0	0	1	0	0	0	0	0	0
Passeriformes	Turdidae	Catharus ustulatus	Zorzal de Anteojos	T,MI	sc	ne	LC	10	0	0	0	0	0	0	0	2	0
Passeriformes	Turdidae	Myadestes occidentalis	Clarín Jilguero	R	Pr	ne	LC	13	1	0	5	0	0	0	0	4	0
Passeriformes	Turdidae	Myadestes townsendi	Clarín Norteño	MI,R	Pr	ne	LC	12	0	0	0	0	0	0	0	2	0
Passeriformes	Turdidae	Sialia currucoides	Azulejo Pálido	MI	sc	ne	LC	8	0	0	0	0	0	0	0	2	0
Passeriformes	Turdidae	Sialia mexicana	Azulejo Garganta Azul	R,MI	sc	ne	LC	9	0	0	10	3	0	0	0	17	0
Passeriformes	Turdidae	Sialia sialis	Azulejo Garganta Canela	MI,R	sc	ne	LC	7	4	0	41	0	0	0	0	20	1

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Passeriformes	Turdidae	Turdus migratorius	Mirlo Primavera	R,MI	sc	ne	LC	5	43	0	8	4	0	1	0	23	0
Passeriformes	Turdidae	Turdus rufopalliatus	Mirlo Dorso Canela	R	sc	EN	LC	10	97	0	5	0	17	63	0	10	2
Passeriformes	Tyrannidae	Camptostoma imberbe	Mosquerito Chillón	R	sc	ne	LC	10	1	0	0	0	0	0	3	0	0
Passeriformes	Tyrannidae	Contopus cooperi	Papamoscas Boreal	T,MI,MV	sc	ne	NT	13	0	0	0	0	0	2	0	1	0
Passeriformes	Tyrannidae	Contopus pertinax	Papamoscas José María	R	sc	ne	LC	12	1	0	9	0	0	0	0	9	0
Passeriformes	Tyrannidae	Contopus sordidulus	Papamoscas del Oeste	MV,T	sc	ne	LC	11	6	0	8	2	2	4	2	21	1
Passeriformes	Tyrannidae	Empidonax affinis	Papamoscas Pinero	R	sc	CE	LC	13	0	0	7	0	0	0	0	1	0
Passeriformes	Tyrannidae	Empidonax fulvifrons	Papamoscas Pecho Canela	R,MI,MV	sc	ne	LC	12	0	0	2	0	0	0	0	1	0
Passeriformes	Tyrannidae	Empidonax hammondii	Papamoscas de Hammond	MI	sc	ne	LC	9	0	0	0	1	0	0	1	0	0
Passeriformes	Tyrannidae	Empidonax minimus	Papamoscas Chico	MI	sc	ne	LC	10	13	0	3	2	0	1	0	12	0
Passeriformes	Tyrannidae	Empidonax oberholseri	Papamoscas Matorralero	MI	sc	SE	LC	11	5	0	3	0	3	0	1	21	0
Passeriformes	Tyrannidae	Empidonax occidentalis	Papamoscas Amarillo Barranqueño	R,MI,MV	sc	SE	LC	11	0	0	23	0	0	0	1	15	0
Passeriformes	Tyrannidae	Empidonax traillii	Papamoscas Saucero	MI	sc	ne	LC	10	0	0	0	0	0	0	0	0	0
Passeriformes	Tyrannidae	Empidonax wrightii	Papamoscas Bajacolita	MI	sc	SE	LC	9	10	0	4	2	2	0	0	9	0
Passeriformes	Tyrannidae	Mitrephanes phaeocercus	Papamoscas Copetón	R	sc	ne	LC	13	0	0	5	0	0	0	0	0	0
Passeriformes	Tyrannidae	Myiarchus cinerascens	Papamoscas Cenizo	MI,MV,R	sc	ne	LC	9	42	0	4	3	3	0	3	13	4
Passeriformes	Tyrannidae	Myiarchus tuberculifer	Papamoscas Triste	R	sc	ne	LC	9	8	0	0	1	2	0	1	1	0

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Passeriformes	Tyrannidae	Myiarchus tyrannulus	Papamoscas Gritón	R,MV	sc	ne	LC	9	7	0	4	0	6	0	1	1	0
Passeriformes	Tyrannidae	Myiodynastes luteiventris	Papamoscas Rayado Común	MV	sc	ne	LC	11	0	0	1	0	0	0	0	0	0
Passeriformes	Tyrannidae	Myiozetetes similis	Luisito Común	R	sc	ne	LC	5	0	0	0	0	0	0	1	0	0
Passeriformes	Tyrannidae	Pitangus sulphuratus	Luis Bienteveo	R	sc	ne	LC	5	204	0	3	2	18	85	2	46	13
Passeriformes	Tyrannidae	Pyrocephalus rubinus	Papamoscas Cardenalito	R,MI	sc	ne	LC	5	1090	1	32	33	65	190	18	168	178
Passeriformes	Tyrannidae	Sayornis nigricans	Papamoscas Negro	R,MI	sc	ne	LC	9	145	0	48	10	30	5	9	95	5
Passeriformes	Tyrannidae	Sayornis phoebe	Papamoscas Fibí	MI	sc	ne	LC	8	2	0	0	0	6	0	0	4	0
Passeriformes	Tyrannidae	Sayornis saya	Papamoscas Llanero	R,MI	sc	ne	LC	8	47	0	2	19	10	6	0	48	8
Passeriformes	Tyrannidae	Tyrannus crassirostris	Tirano Pico Grueso	R,MV,MI	sc	SE	LC	12	0	0	0	0	0	2	0	0	0
Passeriformes	Tyrannidae	Tyrannus melancholicus	Tirano Pirirí	R	sc	ne	LC	4	18	0	0	0	0	2	0	0	2
Passeriformes	Tyrannidae	Tyrannus verticalis	Tirano Pálido	MI,T,MV	sc	ne	LC	9	2	0	0	0	0	0	0	0	0
Passeriformes	Tyrannidae	Tyrannus vociferans	Tirano Chibiú	R,MI	sc	SE	LC	9	564	0	19	26	93	289	20	157	250
Passeriformes	Vireonidae	Vireo bellii	Vireo de Bell	MI,MV	sc	ne	NT	15	0	0	0	0	0	0	0	0	0
Passeriformes	Vireonidae	Vireo cassinii	Vireo de Cassin	MI,MV,R	sc	SE	LC	11	5	0	0	0	0	0	1	0	0
Passeriformes	Vireonidae	Vireo gilvus	Vireo Gorjeador	MI,R	sc	ne	LC	8	9	0	9	0	0	1	1	0	0
Passeriformes	Vireonidae	Vireo huttoni	Vireo Reyezuelo	R	sc	ne	LC	10	7	0	17	0	1	0	0	31	0
Passeriformes	Vireonidae	Vireo plumbeus	Vireo Plomizo	MI,R,MV	sc	ne	LC	10	5	0	4	0	0	0	0	7	0
Pelecaniformes	Ardeidae	Ardea alba	Garza Blanca	MI,R	sc	ne	LC	7	329	1	8	5	79	45	48	177	5

WEALTH AND DISTRIBUTON OF BIRDS IN AGUASCALIENTES																		
Orden	Family	Scientific name	Common name	Residence	NOM-059	Endemism	UICN	Vulnerability	Observated individuals per municipality									
									Ag	As	Ca	El	Je	Pa	Ri	Sa	Te
Pelecaniformes	Ardeidae	Ardea herodias	Garza Morena	MI,R	sc	ne	LC	7	13	0	2	3	8	4	4	28	0
Pelecaniformes	Ardeidae	Bubulcus ibis	Garza Ganadera	R,MI	sc	Exo	LC	6	859	0	25	6	32	663	21	76	320
Pelecaniformes	Ardeidae	Butorides virescens	Garcita Verde	R,MI	sc	ne	LC	11	7	0	0	0	0	0	0	1	0
Pelecaniformes	Ardeidae	Egretta caerulea	Garza Azul	MI,R	sc	ne	LC	13	0	0	0	0	0	0	0	1	0
Pelecaniformes	Ardeidae	Egretta thula	Garza Dedos Dorados	MI,R	sc	ne	LC	8	212	1	3	0	12	0	4	46	0
Pelecaniformes	Ardeidae	Nycticorax nycticorax	Garza Nocturna Corona Negra	R,MI	sc	ne	LC	10	70	0	0	1	14	2	11	98	8
Pelecaniformes	Pelecanidae	Pelecanus erythrorhynchos	Pelícano Blanco Americano	MI	sc	ne	LC	12	11	0	0	0	61	0	7	73	0
Pelecaniformes	Pelecanidae	Pelecanus occidentalis	Pelícano Café	R,MI	sc	ne	LC	11	0	0	0	0	0	0	0	1	0
Pelecaniformes	Threskiornithidae	Eudocimus albus	Ibis Blanco	R,MI	sc	ne	LC	12	0	0	0	0	0	6	0	0	0
Pelecaniformes	Threskiornithidae	Plegadis chihi	Ibis Ojos Rojos	MI,R	sc	ne	LC	8	1528	0	0	41	14	823	0	15	1331
Piciformes	Picidae	Colaptes auratus	Carpintero de Pechera Común	R,MI	sc	ne	LC	10	63	0	18	3	12	7	0	38	3
Piciformes	Picidae	Melanerpes aurifrons	Carpintero Cheje	R	sc	ne	LC	9	768	1	2	6	102	268	24	114	159
Piciformes	Picidae	Melanerpes formicivorus	Carpintero Bellotero	R	sc	ne	LC	9	12	0	54	6	19	3	0	118	0
Piciformes	Picidae	Picoides arizonae	Carpintero de Arizona	R	sc	CE	LC	14	0	0	1	0	0	0	0	0	0
Piciformes	Picidae	Picoides scalaris	Carpintero Mexicano	R	sc	ne	LC	9	110	2	35	9	20	3	4	68	1
Piciformes	Picidae	Picoides villosus	Carpintero Albinegro Mayor	R	sc	ne	LC	6	0	0	3	0	0	0	0	7	0

WEALTH AND DISTRIBUTON OF BIRDS IN AGUASCALIENTES																	
Orden	Family	Scientific name	Common name	Residence	NOM-059	Endemism	UICN	Vulnerability	Observated individuals per municipality								
									Ag	As	Ca	El	Je	Pa	Ri	Sa	Te
Piciformes	Picidae	Sphyrapicus varius	Carpintero Moteado	MI	sc	ne	LC	7	18	0	0	0	2	9	0	2	2
Podicipediformes	Podicipedidae	Aechmophorus clarkii	Achichilique Pico Naranja	R,MI	sc	ne	LC	15	0	0	0	0	0	0	0	38	0
Podicipediformes	Podicipedidae	Podiceps nigricollis	Zambullidor Orejón	MI,R	sc	ne	LC	9	38	2	0	2	12	0	0	43	0
Podicipediformes	Podicipedidae	Podilymbus podiceps	Zambullidor Pico Grueso	R,MI	sc	ne	LC	9	64	0	0	0	6	0	0	23	0
Podicipediformes	Podicipedidae	Tachybaptus dominicus	Zambullidor Menor	R	Pr	ne	LC	8	140	0	0	0	0	0	0	7	0
Psittaciformes	Psittacidae	Ara militaris	Guacamaya Verde	R	P	ne	VU	18	0	0	3	0	0	0	0	0	0
Psittaciformes	Psittacidae	Myiopsitta monachus	Perico Monje Argentino	R	sc	Exo	LC	6	27	0	0	0	0	0	0	0	0
Strigiformes	Strigidae	Athene cunicularia	Tecolote Llanero	R,MI	sc	ne	LC	12	1	0	0	0	0	0	0	0	0
Strigiformes	Strigidae	Bubo virginianus	Búho Cornudo	R	sc	ne	LC	6	23	0	0	0	0	0	0	0	0
Strigiformes	Strigidae	Glaucidium gnoma	Tecolote Serrano	R	sc	ne	LC	11	0	0	2	0	0	0	0	1	0
Strigiformes	Strigidae	Megascops trichopsis	Tecolote Rítmico	R	sc	ne	LC	14	0	0	1	0	0	0	0	0	0
Strigiformes	Strigidae	Strix occidentalis	Búho Moteado	R	A	ne	NT	15	0	0	1	0	0	0	0	0	0
Strigiformes	Tytonidae	Tyto alba	Lechuza de Campanario	R	sc	ne	LC	9	3	0	0	0	0	8	0	2	0
Suliformes	Phalacrocoracidae	Phalacrocorax brasilianus	Cormorán Neotropical	R	sc	ne	LC	8	420	0	0	0	108	0	25	1394	0
Trogoniformes	Trogonidae	Trogon elegans	Coa Elegante	R	sc	ne	LC	14	0	0	6	0	3	0	3	5	0
Trogoniformes	Trogonidae	Trogon mexicanus	Coa Mexicana	R	sc	ne	LC	14	0	0	3	0	0	0	0	0	0

Anexo IV. Threatened species

Threatened species in Aguascalientes				
Group	**Orden**	**Family**	**Taxon**	**Category NOM-059-SEMARNAT-2010**
Amphibia	Anura	Hylidae	Smilisca dentata	Threatened (A)
Amphibia	Anura	Ranidae	Lithobates montezumae	Subject to special protection (Pr)
Amphibia	Anura	Ranidae	Lithobates neovolcanicus	Threatened (A)
Amphibia	Caudata	Plethodontidae	Isthmura bellii	Threatened (A)
Aves	Accipitriformes	Accipitridae	Accipiter cooperii	Subject to special protection (Pr)
Aves	Accipitriformes	Accipitridae	Accipiter striatus	Subject to special protection (Pr)
Aves	Accipitriformes	Accipitridae	Buteo albonotatus	Subject to special protection (Pr)
Aves	Accipitriformes	Accipitridae	Buteo lineatus	Subject to special protection (Pr)
Aves	Accipitriformes	Accipitridae	Buteo regalis	Subject to special protection (Pr)
Aves	Accipitriformes	Accipitridae	Buteo swainsoni	Subject to special protection (Pr)
Aves	Accipitriformes	Accipitridae	Parabuteo unicinctus	Subject to special protection (Pr)
Aves	Charadriiformes	Charadriidae	Charadrius montanus	Threatened (A)
Aves	Charadriiformes	Charadriidae	Charadrius nivosus	Threatened (A)
Aves	Falconiformes	Falconidae	Falco mexicanus	Threatened (A)
Aves	Falconiformes	Falconidae	Falco peregrinus	Subject to special protection (Pr)
Aves	Galliformes	Odontophoridae	Cyrtonyx montezumae	Subject to special protection (Pr)
Aves	Gruiformes	Rallidae	Rallus limicola	Threatened (A)
Aves	Passeriformes	Cardinalidae	Passerina ciris	Subject to special protection (Pr)
Aves	Passeriformes	Emberizidae	Spizella wortheni	In danger of extinction (P)
Aves	Passeriformes	Parulidae	Geothlypis tolmiei	Threatened (A)

Threatened species in Aguascalientes				
Group	**Orden**	**Family**	**Taxon**	**Category NOM-059-SEMARNAT-2010**
Aves	Passeriformes	Turdidae	Myadestes occidentalis	Subject to special protection (Pr)
Aves	Pelecaniformes	Ardeidae	Botaurus lentiginosus	Threatened (A)
Aves	Pelecaniformes	Ardeidae	Ixobrychus exilis	Subject to special protection (Pr)
Aves	Psittaciformes	Psittacidae	Rhynchopsitta pachyrhyncha	In danger of extinction(P)
Aves	Strigiformes	Strigidae	Asio flammeus	Subject to special protection (Pr)
Aves	Strigiformes	Strigidae	Strix occidentalis	Threatened (A)
Aves	Accipitriformes	Accipitridae	Geranoaetus albicaudatus	Subject to special protection (Pr)
Mammalia	Rodentia	Erethizontidae	Erethizon dorsatum	In danger of extinction (P)
Mammalia	Chiroptera	Phyllostomidae	Choeronycteris mexicana	Threatened (A)
Mammalia	Rodentia	Cricetidae	Nelsonia neotomodon	Subject to special protection (Pr)
Mammalia	Chiroptera	Phyllostomidae	Leptonycteris nivalis	Threatened (A)
Mammalia	Rodentia	Heteromyidae	Dipodomys phillipsii	Subject to special protection (Pr)
Mammalia	Chiroptera	Phyllostomidae	Leptonycteris yerbabuenae	Threatened (A)
Peces	Cyprinodontiformes	Goodeidae	Allotoca dugesii	In danger of extinction (P)
Reptilia	Squamata	Anguidae	Elgaria kingii	Subject to special protection (Pr)
Reptilia	Squamata	Anguidae	Gerrhonotus liocephalus	Subject to special protection (Pr)
Reptilia	Squamata	Phrynosomatidae	Phrynosoma orbiculare	Threatened (A)
Reptilia	Squamata	Colubridae	Lampropeltis mexicana	Threatened (A)
Reptilia	Squamata	Colubridae	Pituophis deppei	Threatened (A)
Reptilia	Squamata	Dipsadidae	Rhadinaea hesperia	Subject to special protection (Pr)

Threatened species in Aguascalientes				
Group	**Orden**	**Family**	**Taxon**	**Category NOM-059-SEMARNAT-2010**
Reptilia	Squamata	Colubridae	Salvadora bairdi	Subject to special protection (Pr)
Reptilia	Squamata	Natricidae	Thamnophis cyrtopsis	Threatened (A)
Reptilia	Squamata	Natricidae	Thamnophis eques	Threatened (A)
Reptilia	Squamata	Natricidae	Thamnophis scaliger	Threatened (A)
Reptilia	Squamata	Elapidae	Micruroides euryxanthus	Threatened (A)
Reptilia	Squamata	Elapidae	Micrurus distans	Subject to special protection (Pr)
Reptilia	Squamata	Viperidae	Crotalus aquilus	Subject to special protection (Pr)
Reptilia	Squamata	Viperidae	Crotalus lepidus	Subject to special protection (Pr)
Reptilia	Squamata	Viperidae	Crotalus molossus	Subject to special protection (Pr)
Reptilia	Squamata	Viperidae	Crotalus polystictus	Subject to special protection (Pr)
Reptilia	Squamata	Viperidae	Crotalus pricei	Subject to special protection (Pr)
Reptilia	Squamata	Viperidae	Crotalus scutulatus	Subject to special protection (Pr)
Reptilia	Testudines	Kinosternidae	Kinosternon hirtipes	Subject to special protection (Pr)
Reptilia	Testudines	Kinosternidae	Kinosternon integrum	Subject to special protection (Pr)
Reptilia	Squamata	Scincidae	Plestiodon lynxe	Subject to special protection (Pr)
Reptilia	Squamata	Natricidae	Thamnophis nigronuchalis	Subject to special protection (Pr)
Reptilia	Squamata	Natricidae	Thamnophis melanogaster	Threatened (A)
Reptilia	Squamata	Colubridae	Coluber flagellum	Threatened (A)

Source: http://bdi.conabio.gob.mx/fotoweb/Grid.fwx

Source: http://www.gob.mx/sectur/articulos/fundacion-de-aguascalientes


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