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Contribution to the Characterization of Peri-urban Natural Areas of Sidi Bel Abbes Town (Northwestern Algeria).

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Abstract

Peri-urban areas are very important in the geographical structure of the city, a boundary for urban sprawl, diversifying the territory and its landscape, creating continuity. These areas constituted a problem to geographers and statisticians who wished to assign them contours. The delimitation of peri-urban areas is indeed difficult and must combine geographic, urban, economic and human parameters that might render account of a movement that affects almost all areas. Our approach is a contribution to the use of simple and rapid decisions as a tool for the characterization of natural space in the suburban town of Sidi Bel Abbes. It is based on a diagnosis of the current situation in this municipality. The study allowed us to identify 106 natural areas in a suburban area of over 3969.36 hectares. Despite their spatial importance, these areas remain largely forgotten; It is therefore necessary to know their functions, developments and potential in order to keep the suburban biodiversity.

Keywords: Suburban natural space; Sidi Bel Abbes; valorization; Biodiversity.

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1-Introduction

Although cities are by definition the field of human, nature has also its place. The human being causes permanent changes in its environment to satisfy their basic needs, and has therefore an impact on the natural environment artificialized [6]. Natural spaces can help people to feel as responsible citizens in their city and its environment, since they are very important to the geographical structure forming a boundary for urban sprawl, diversifying the territory and its landscape, creating continuity [7]. These areas often welcome, generally involuntarily, populations who have difficulty finding venues for their activities in the rest of the urban area. Peri-urban natural areas become a necessity and a priority in view of advantages they bring to our cities [2].

Our present study has as an objective the diagnosis of peri-urban natural areas in the town of Sidi Bel Abbes, to deduce subsequently the crucial role it plays in the ecological balance of our city, knowing that the said town occupies the central part of a vast plain, recognized as the most fertile agricultural areas of the province.

2. Study area

The plain of Sidi Bel Abbes (Figure 1) is situated between Jebel Tessala in the north and the mountains of Daya in the south. It is isolated from the marine influence by the imposing barrier of Tessala-Beni Chougrane. It has a continental Mediterranean climate, with low rainfall and strong temperature variations, summer storms are the dominant features [1].

2.1 climate

The plain of Sidi Bel Abbes, is at a470mof altitude. It is almost closed north east at the junction Tessala-Beni Chougrane. The plain of Sidi Bel Abbes therefore has a semi-arid continental Mediterranean climate, characterized by drought, high temperature differential and summer storms, are the dominant features. The climatic characteristics of Sidi Bel Abbes town were established from the meteorological station of Sidi Bel Abbes [3].

2.1.1 Pluviometry

The pluviometric data for the period 1988-2005 showed that precipitation remain in their average at 400mm.The dominant seasonal pluviometric type is the HPAE. The average volume of annual rainfall is around 1.6 billion cubic meters, often badly distributed in space and time with very significant agronomic impacts [4].

2.1.2 Températures

Temperatures are characterized by a significant increase in the summer, and a flagrant decrease in winter, especially during the night. The coldest months are usually January and February, during which the average annual temperatures vary between 0.4 and 14.2 °C. The warmest month is August, where the average annual temperature varies between a minimum of 26,6 C° and a maximum of 34,8C°. Winter is characterized by a decrease in temperature between November and April, frosts are to fear in this period too. The following table

shows the average temperatures of the town of Sidi Bel Abbes for a period of 17 years [4].

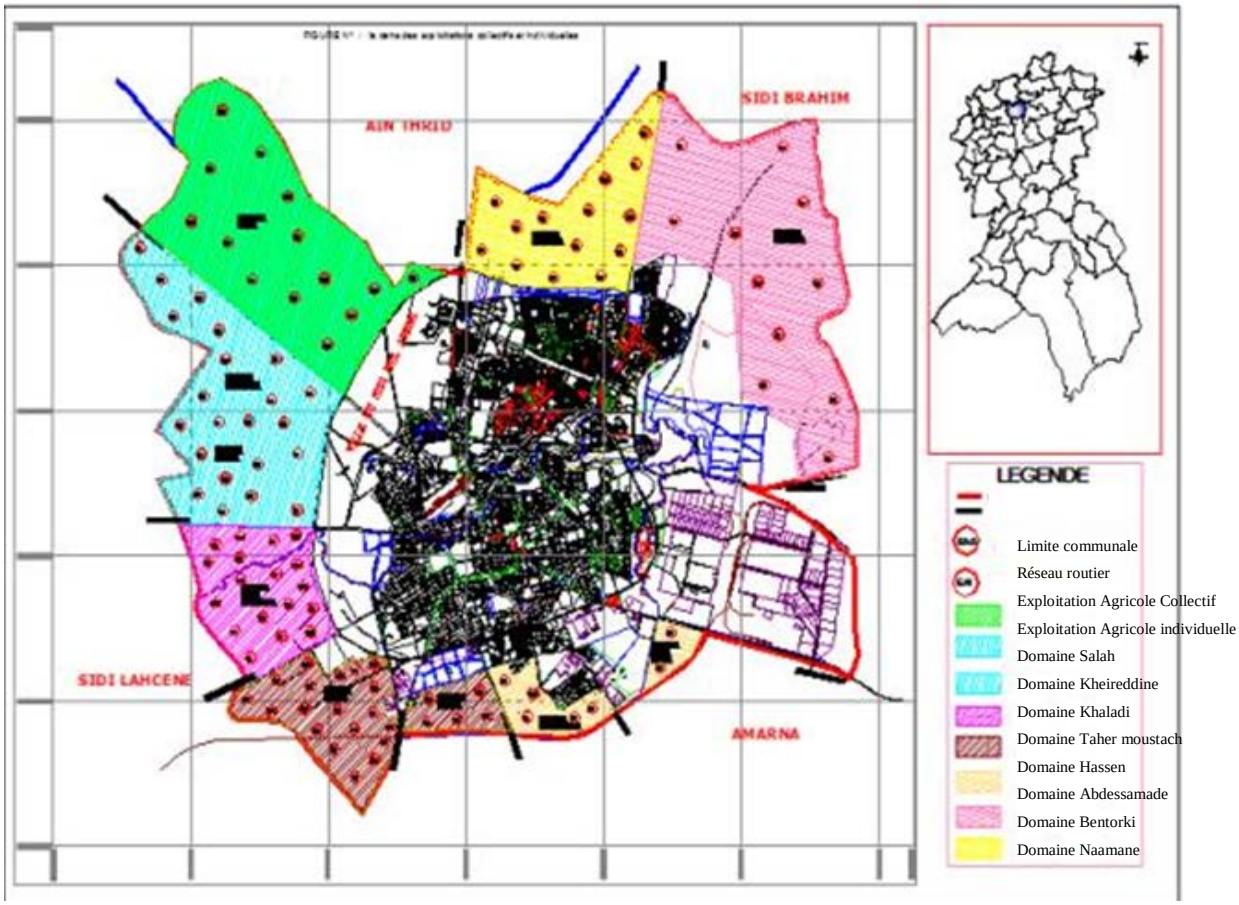

Figure 1: Geographical position of the study area (Sidi Bel Abbés-Algeria) [3].

2.2 Environmental characteristics

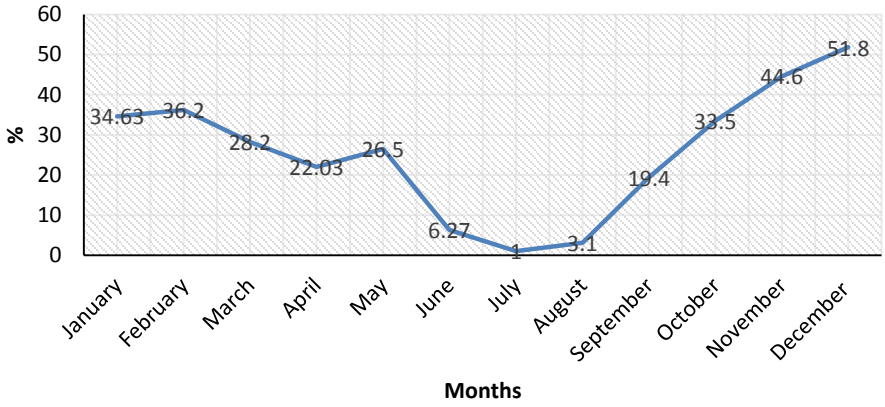

Figure 2: Average monthlyrainfallin17 years in Sidi Bel Abbes town (1988 to 2005) [4].

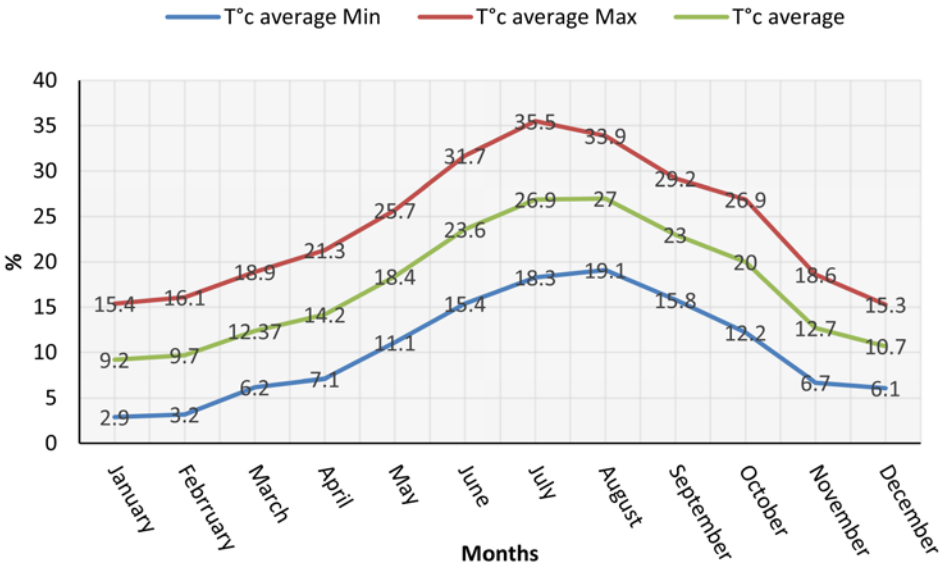

Figure 3: Average monthly temperature for the period (1988-2005). Source [4]

2.3 Soil

Regarding soils in semi-arid regions. These are made of materials from the alteration of sandstone or limestone torn from surrounding landforms. These soils are thin and contain low organic matter content, (Aubert, 1960). The rocks are calcareous and make difficult the differentiation of soils [4].

2.3.1 Main soil types

- Alluvial soils in the valleys of the wadi Mekerra. On average, deep soils occupy about 30% of the plain of Sidi BelAbbes.
- Limestone crust soils in the high steppe plains (90%of the area), also in the alluvial plains of Sidi Bel Abbes. Limestone crust is more or less hardened and variable depth, depending on the local terrain.
- Limestone crust soils in the high steppe plains (90% of the area), also in the alluvial plains of Sidi Bel Abbes. The limestone soils whose importance varies from one area to another, 40% in the plains of Sidi Bel Abbes, 70% in the high plains and mountains of Telagh and Beni Chougrane, and 90 to 100% in the Mountains of Tessala [1].

2.3.2 Land use in the town of Sidi Bel Abbes

Urban sprawl changed the image of the city. We now accept that the expansion of cities cannot be stopped, and the solution is to control the expansion of cities, so that they will be synonymous of economic growth and satisfactory environment. In this context, the creation and conservation of peri-urban natural is necessary [5].

Indeed, the town of Sidi Bel Abbes had a population in the order of 88632 inhabitants in 1966 to attain 204181 in 2008. The forecast for 2015 estimates the population at 305,000 inhabitants. The city of Sidi Bel Abbes is a confirmed regional pole with a strategic position in the region, dense communication network with great economic, commercial and industrial potentialities to exploit [5].

The analysis of the general distribution of land, revealed that the vegetation cover occupied only3% (221 ha) of the total area, against 36% reserved for built-up land, and more than half of the total area of the municipality, 4243 ha was represented by bare land [5].

Table 1: Soil classification according to their agro-soil potentials [1].

Class	Surface (ha)	Classification criteria	Pedological suitability	Localization
Class1 High potentiality	**3.563**	- Alluvial soil high organic matter content. -Rooting depth greater than 80cm. - Low Slope of0-3% -Location of ground water at shallow depth.	-Intensive arboriculture.	- South-West of SBA. - North-East and South of Sidi Lahcène.
Class2 Good potentiality	**6.945**	-brown Soil with the presence of limestone elements. -Rooting depth between 60 and 80cm. -Slope of 3 to 5%.	-shallow rooted culture -tracing root System: apricot, plum, Peche, grapes	-West and South-East of SBA municipality. -North of Amarnas municipality. Periphery of Sidi Brahim. -South of Tilmouni municipality.
Class3 Average potentiality	**19.730**	Ground with light limestone crust. Rooting depthless than 30cm.Brackishwaterpresence.	-Cereals, forages on a low slope -rustic viticulture on a medium slope -Oleiculture.	-West of Sidi Lahcène -¾ of Sidi Brahim and Zérouala municipalities. -South of Amarnas -West de Tilmouni.
Class4 Low potentiality	**6.760**	- calcimorphic soils on soft rocks or shallow Rendzines. -Slope more than 8%. - High porosity.	-Reforestation -Rustic apiculture	North of Tilmouni Sidi Lahcène municipalities Northeast and Southwest of Zérouala.

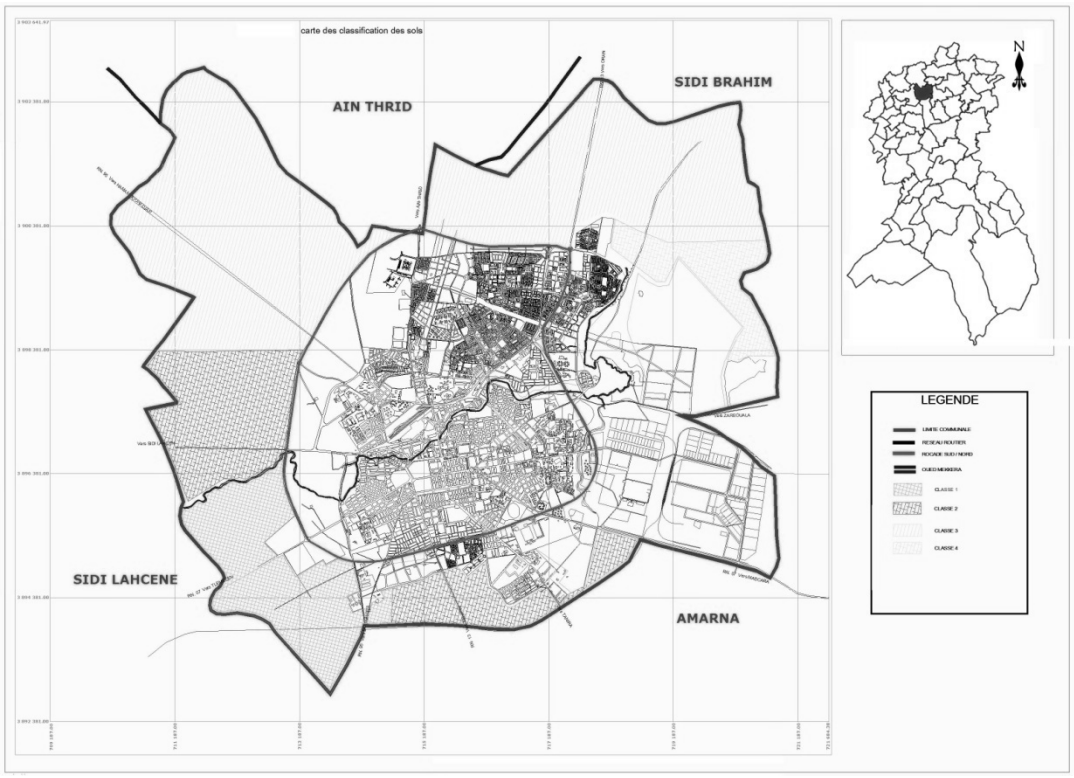

Figure 4: Map showing soil classification in the town of Sidi Bel Abbes. Source [8]

4. Material and Methods

The methodological approach was done following these steps:

First step: we considered important to begin our study with data collection concerning the town of Sidi Bel Abbes, by contacting state agencies responsible of management and planning of land use.

Second step: a survey on land was necessary on one side to get closer to land realities, and to confirm or refute the data collected, and on the other hand, to adapt the same data, to the objective of our study, which is characterization, and conservation of the natural suburban areas of the town of Sidi Bel Abbes.

Third step: cartographic representations of our results.

4.1 Data Collection

For the purposes of this study, we investigated, with the various departments concerned, which are:

1. The Cadastre,
2.Urbat,
3. The environment directorate,

4. The agricultural services directorate of the wilaya of SBA (DSA)
5. The delegation of agricultural services at Municipality of SBA.

5. Results and discussion

After the achievement of several investigations in the field and based on information collected from municipal delegates of agricultural services of the wilaya of Sidi Bel Abbes we realized that our study was represented by 08 main areas including a number of suburban areas.

Table 2: Representation of the different agricultural domains [8].

Domain	Localization	Soil nature	Activity
Salah	North and North-West	Alluvial soil	Market gardening
Hassen	South and South-West	brown calcareous+ alluvial soil	
Khalladi	West	brown calcareous	
Taher Moustache	West et south-west		
Kheireddine	west		Cereals
Abd Es Samad	East		
Ibn eTorki	North and North-East		Cereals et Forage
Naama	North		Cereals and Market gardening

The surface of areas studied varied from 1hato 167ha, which will allow us to classify them;

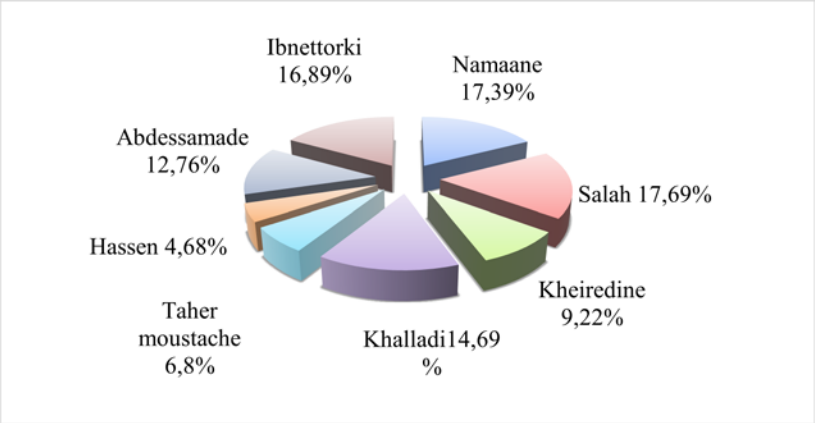

Figure 5: Classification of domains according to the area occupied [9].

Peri urban spaces of Sidi Bel Abbes town are agricultural and are mainly represented by collective farms and individual ones. They are usually employed in most, by cereal crops, market gardening and fruit growing.

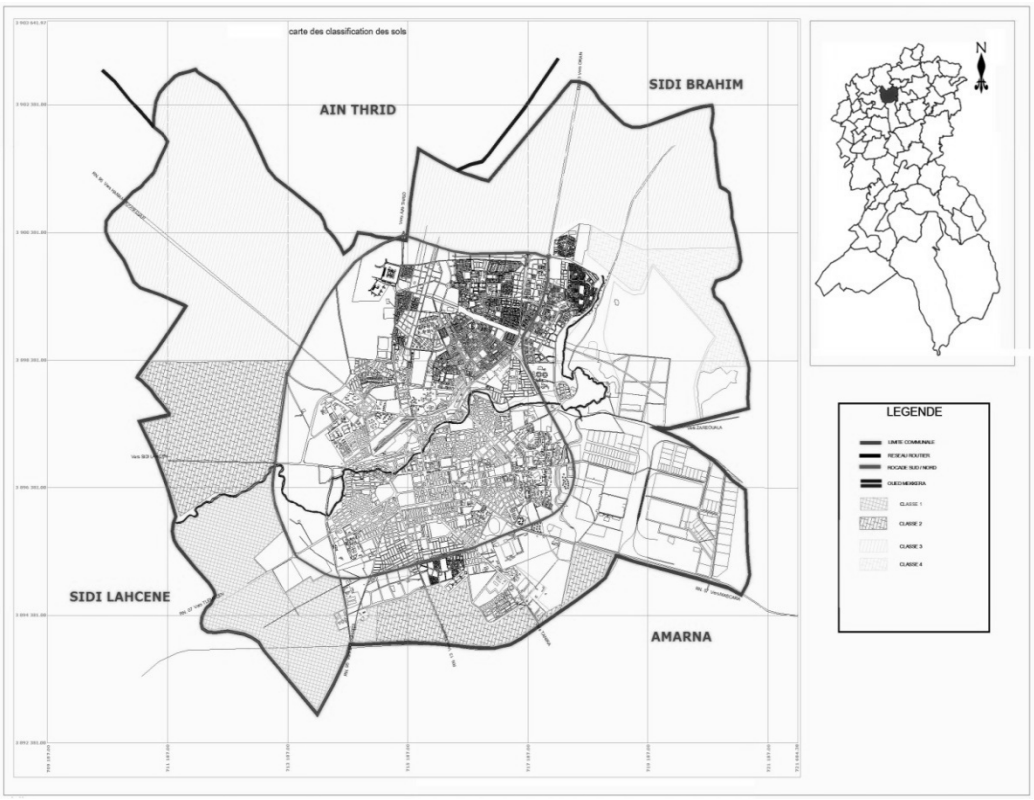

Figure 6: Map of collective and individual farms [5].

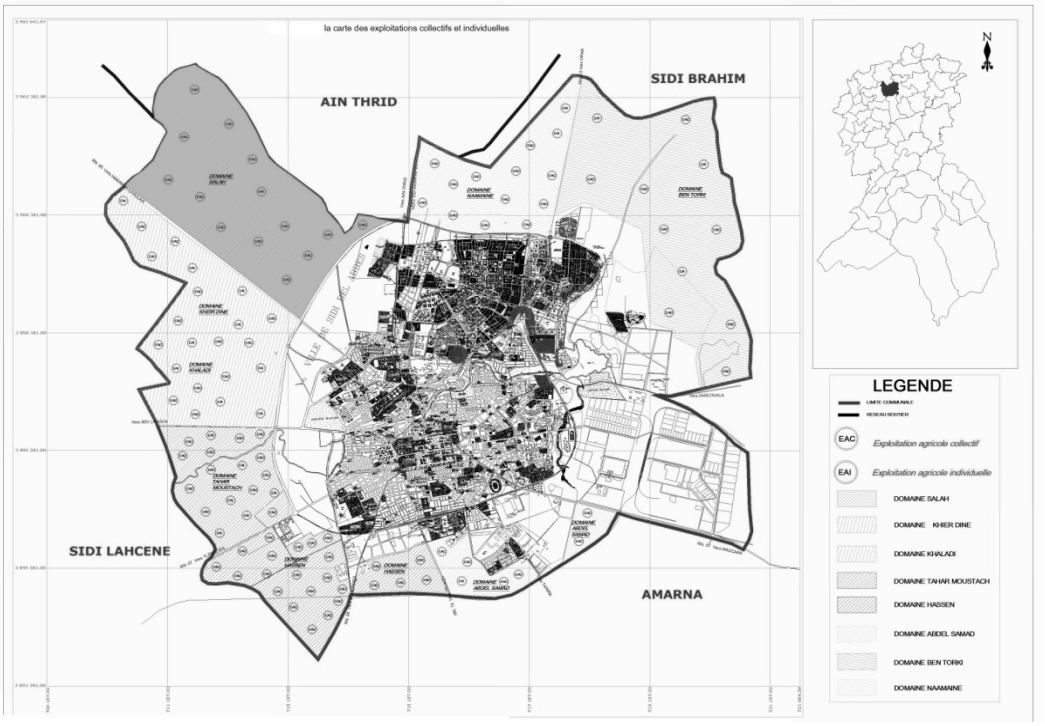

Figure 7: Map of cultures carried out by exploitation [5].

These agricultural areas represent a considerable challenge for the community in general, and the city in particular. They welcome important economic activities and play a role in the social balance of the city. Also represents places of oxygenation for urban residents in contact with the nature and rural areas.

However, the aggression of these urban agricultural areas, in the case of the city of Sidi Bel Abbes, caused by the constant urbanization accelerated their destruction, generating the following consequences:

- The weakening of ecosystem functioning.
- The irreversible loss of values of large agricultural lands.
- The destruction of natural habitats, hence a threat to plant and animal species living in these habitats.
- The increase in land prices.
- The increase in global warming due to the removal of natural agricultural areas, which store carbon.

5.1 Identification of the peri urban-biodiversity

We have deduced that the vegetal biodiversity is represented by an exclusively agricultural species, mainly formed by the cereal crop, then market gardens and fruit trees.

Agricultural biodiversity includes all components of biological diversity, which are important for trophic chain. The variety of animals, plants and microorganisms, are necessary to maintain the essential functions of the agricultural ecosystem [10].

In addition, to this agricultural biodiversity, a parallel spontaneous plant biodiversity cohabits. After several trips to the field during all seasons of the year 2008, a herbarium was performed at each PNA (Peri urban Natural Area). Identification of species collected, was done in the laboratory of plant taxonomy, in the environmental sciences department at the Faculty of Life Sciences and Nature, University of Sidi Bel Abbes-Djillali Liabes. The results are described in the following table:

Table 3: Identification of the different species collected [5].

n°	***Scientific name***
01	*Anchusa azurea Mill*
02	*Avena sterilis L.*
03	*Cardaria draba L.*
04	*Centaurea diluta Ait*
05	*Chenopodium vulvaria L.*
06	*Chrysanthemum coronarium L.*
07	*Convolvulus arvensis L.*
08	*Hordeum murimum L.*
09	*Lolium multiflorum L.*
10	*Malva sylvestris L.*

11	*Papaver hybridum L.*
12	*Papaver rhoeas L.*
13	*Rumex bucephalophorus L.*
14	*Silène fuscata Link*
15	*Sinapis alba L.*
16	*Triticum aestivum L.*
17	*Triticum durum L.*
18	*Daucus gummifer Lamk*
19	*Solanum tuberosum L.*
20	*Lycopersicon esculentum Mill.*
21	*Mentha sp.*
22	*Eucalyptus globulus labill*
23	*Pinus halepensis L.*
24	*Amygdalus communis*
25	*Olea europea L.*
26	*Ficus carica L.*
27	*Pirus longipes*
28	*Persica communis*
29	*Prunus domestica*
30	*Malus communis*

After species identification, we found the presence of two groups of species divided on two subgroups, as shown in the above schemes:

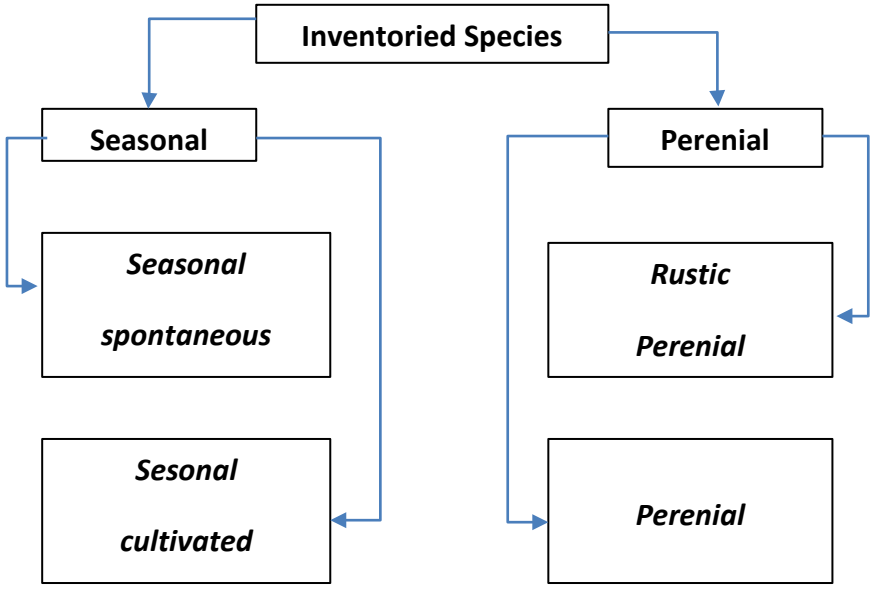

Figure 8: Types of species inventoried according to their lifespan.

Note: cultivated seasonal plant species are vegetable crops, while spontaneous seasonal weeds are usually cereal crops. For perennial species, they are represented by fruit trees such as apple, pear and rustic perennials, which are usually species such as olive tree, the Alep pine and Eucalyptus.

6. Conclusion

Our study on peri urban natural areas revealed a lot of information about their characteristics. These first strategic areas, which are part of the city of Sidi Bel Abbes are unfortunately neglected by the authorities in spite of their environmental, social and economic importance.

Nonetheless, these undeveloped areas are not simply gaps to the proximity of the urban tissue but constitute useful territories, hosting many important economical and social human activities, marking the meeting of the city and the countryside, landscape, recreation, agriculture and production. Knowledge and recognition by all of peri urban natural areas are an unavoidable action for their valorization [11]. These natural areas are real tools for the reconquest of urban and suburban landscapes. They are at the heart of the major challenges of future sustainable urban development. Even more, sustainability and identity of cities are largely related. Peri-urban natural areas must be protected by adapted legislation. Citizens must be engaged in the valuation process of vital areas, but also becoming full participants of the projects. Thus, peri urban natural areas may become fundamental elements at the service of a sustainable city.

6.1 Recommendations

The action towards suburban natural areas must have two main objectives: Protect and Enhance.

Protect

Under considerable pressure, peri-urban natural areas often know rapid regression (urbanization, transport infrastructure...), and even more significant degradation(artificial) that are usually irreversible. It is therefore essential to preserve natural areas and highlight that PNA should be spread over the entire urban area, to be easily accessible by citizens.

Develop

These spaces deserve to express their great potential. Peri-urban natural areas are the places of mixed uses and functions. This diversity contributes to the richness of the territories, which host both rural functions (agriculture) and urban functions (recreation), and cultural functions (landscape, historical heritage).

The mixed nature of spaces does not mean that "anything is possible"; these spaces should not be considered as gaps in the urban tissue, but as integral elements of cities, designed to accommodate the functions that enhance the natural character of the place.

The issue of agriculture is an important theme of management of peri-urban areas. It is desirable to maintain a

dynamic agriculture nearby cities, protecting them from the effects of urban pressure. Agriculture must become one of the multifunctional spaces facets. In this sense, it must take into account the other functions of this space, such as public reception and biodiversity. Since the natural areas of the suburban town of Sidi Bel Abbes, are agricultural areas, preferably with an economic role, and it would be desirable that they remain profitable for the population as a means of contact with the natural environment, away from any stress or pollution.

Knowing that the city of Sidi Bel Abbes, is always exposed to dusty winds in summer coming from the south and southwest, it would be necessary to establish a green belt for protection fitting the existing outlines of the urban tissue, with an average width of 20 meters depending on the availability and configuration of space.

The planting must staggered, with a very high density of the order of 5,000 plants per hectare, to provide a biological curtain. To this end it is appropriate to choose shrub and tree species, allowing the use of this belt by citizens as a place of relaxation and leisure.

The recommended plant species can be summarized as follows:

• Evergreen Tree Species: Pine, Cypress, Casuarina, ash, willow, poplar, hackberry, carob tree, plum trees
• Deciduous tree Species: Sophora, Melia, plane tree, Judas tree, maple.
• Shrub species: Privet, Pittosporum, Charcoal, Laurier, Palm and Tuya.

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