Climate change and its impact on the ecosystem on the Ramadi jazira Plateau for the period from 1980 to 2022

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Abstract

To study climate variation for the period from 1980 to 2022 in the ecosystem on the Ramadi Jazira Plateau with gypsiferious desert soil, the current ecosystem was analyzed by measuring the plant community using quantitative methods and comparing it with what it was in 1980. Climatic data were obtained from the Iraqi General Authority for Meteorology and Seismic Monitoring. Drought values in the study area were measured using the SPI analysis and the M-K testis Sen,s slope method was used to determine statistically significant trends in time series of climate and hydrological data. It amounted to 61 modeling sites. The natural vegetation was characterized, determining its type, density, and frequency to identify the nature of the variations occurring in it using random quadrate method with dimensions of 2 m x 2 m. Then the plant species in the area were compared with the Iraqi fluorescence. Use analysis of the percentage of vegetation on the Earth's surface using satellite image to determine the NDVI of the area .

It was observed that there was a linear increase with a highly significant correlation in the average temperature of the region, by 2°C, this increase in temperature was accompanied by a clear linear decrease in the amount of rainfall.

Based on the analysis of the moving average of precipitation for the reference period, it was found that the governorate had begun to suffer from apparent drought.

The NDVI study showed that there was a variation in the types of vegetation cover during 43 years, as there was an increase in Class I decreased by 13.26%, compared to a decrease in Classes II and III by 11.06% and 24.38%, respectively. Perennial plant species recorded the highest percentage among all units, with the disappearance of some previously identified plant species due to climate change as well as human intervention in the region’s environment.

Key words: Climate change, Nature reserves, Vegetation cover, NDVI, Temperature, Iraq.

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.1 Introduction

One of the main challenges facing Iraq is the increase in climate change and the extent of its readiness to deal with them, as these changes lead to irregular water supplies and the decline of agricultural lands. For example, during the drought period that Iraq witnessed in the period 2007-2009, agricultural lands were subject to decline (2021, Hamrawi and Ibrahim) . In vegetation, destroying livestock. The 2009 drought also prompted many rural residents to move from their original places in pursuit of sustainable sources of drinking water and source of income. Data received from the Ministry of Water Resources confirm that the current annual flow of the Tigris and Euphrates rivers in Iraq has decreased significantly over the past years, and drought is one of the main factors responsible for this. Groundwater has also witnessed a decrease in quantity and an increase in salinity, and levels of salinity are expected to decrease. Groundwater (2010, IOM.(

Climate change and its effects have become the most important challenges to the world these days. Natural disasters such as severe drought and famine in Somalia, the hurricane that recently struck Mexico, the intense heat wave in the United States of America, and other manifestations are all indicators of the occurrence of climate change. Vegetation cover is an important factor in maintaining the balance of gases in the atmosphere and has a positive impact in reducing global warming. Since plants cover approximately 20% of the planet Earth, it is not surprising that plants affect climate significantly (2011, Pucko etal.(

A decrease in the rate of precipitation, affecting vegetation cover. Perennial species represented percentages that ranged between 40.0 and 61.4% compared to annual species (2011, Al-Bayati and Al-Alwani), which appeared in percentages that ranged between 38.5 and 60%. When comparing the plant species that were monitored, with what (1966, Guest) indicated for the same sites, it became clear that some species are currently absent due to... Changes occurring in the physical environment within the 98th Kilometer, Kashiti and Fahida oases in western Iraq.

An increase in the general average temperature of the earth in Diyala Governorate in Iraq by 0.74°C for the period extending from 1906 to. 2005 (2015, 5. Wahib and Al-Amouri.(

Noted when they studied climate variation in Iraq for the period 1946 until 2011. The temperature tends toward a positive change and a negative trend in the amount of change in the amount of rain for most climate cycles and months. This change was reflected in the climatic elements in the area of field crops, as the rate of change in the area of field crops trended toward a negative change (2019, Al-Asadi etal.(

To determine changes in the vegetation cover of the Kumel River Basin, located northeast of Al-Sheikhan district within the Kurdistan region - Iraq, (2021, Hamrawi and Ibrahim) noted that the general trend of growth of vegetation cover, distribution of vegetation and its density corresponds to the distribution of temperature rates and rainfall, in addition to complete compatibility with the topography of the region, its slopes, and the quality of the rocks and soil in it.

Explained. Analysis of satellite data for the period from 1981 to 2017 has revealed widespread changes in vegetation cover, especially in areas where human intervention is intense due to poor land management, and

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climate change. in general (2021,Winkler etal.(

The study by (2022, Liang)studied the variations in the temperature at the Xujiahui station in downtown Shanghai, China, to evaluate climate change and its effects by analyzing data for the period from 1873 to 2019, as the results showed an
increase in temperature by 1.9°C. They noticed a significant rise in temperatures, especially after the 1970s.
Studied the effects of temperature changes, and precipitation on natural vegetation in Asia using a biophysical/dynamic vegetation model by analyzing data for the period from 1948 to 2006. The results showed a variation in the effect of temperature on natural vegetation between study areas. In general, there has been a rise in temperature in the arid and semi-arid regions of Western Asia, near the desert, which has caused the disappearance of vegetation. In terms of the effect of global warming on the distribution of plant species, its effect was greater on shrubs and herbs, but less on broad-leaved and coniferous forests (2022, Zhang and Zhai.(

Due to the lack of research examining, assessing and analyzing natural resources within Iraqi Western Desert ecosystem and identifying variations in pedological and ecological aspects, the current study was carried out with the aim of:

-1Analyzing the current ecosystem on the Ramadi Island Plateau by measuring the plant community using quantitative methods and its relationship to the prevailing physical environment (soil and climate) in the region .

-2Comparing the current ecosystem with what it was in 1980.

.2 Materials and methods

.2.1 Study area

The study area is fall within Ramadi District, the center of Anbar Governorate, specifically in terms of location, it is bordered to the north by Lake Tharthar and Wadi Ghariba, to the east by Ramadi Tharthar Road, to the west by the Karoush River and the Euphrates River, and to the south by the Euphrates River. As for the astronomical boundaries of the study area, they are limited in coordinates between latitudes 3,704,000 and 3,739,000 north, and between longitudes 300,000 and 360,000, with an area of 116,491.61 hectares. Figure (1) shows the administrative location of the study area.

.2.2Climatic data

The study relied on official data and government statistics regarding numbers that researchers cannot be diligent about, regarding the vocabulary of climatic elements. Climatic data were obtained from the Iraqi General Authority for Meteorology and Seismic Monitoring, Climate Department. We used rainfall and temperature data recorded during the period 1980-2022 to study trends and differences over 43 years to obtain accurate values in analyzing variables. Drought in the study area was evaluated using Standardized Precipitation Index (SPI) analysis, it is a guide developed by (1993, McKee etal .(
This index was used over a period of 12 months as an indicator of drought in the medium term to support the analysis and applications of hydrological drought in the study area. Table (1) shows the ranges of SPI values and their types.

.2.2.1Mann-Kendall Test M-K testis Sen,s slope

It is one of the methods that provides trend testing, and a valuable tool for examining the presence of trends in data approved by the Intergovernmental Panel on Climate Change (IPCC). It was also proposed by the World

Meteorological Organization (WMO) to identify statistically significant trends in time series of climate and hydrological data (2012, Rahmat etal), as the MK method is used to analyze the trend and obtain trends detected with Sen’s Slope values and its statistical significance at different levels (2014, Taibi etal), based on the trend parameters of Sen, s slope and ß in the M-K methods using the (2017,. XLSTAT) and (2016, M.Excel) programs.

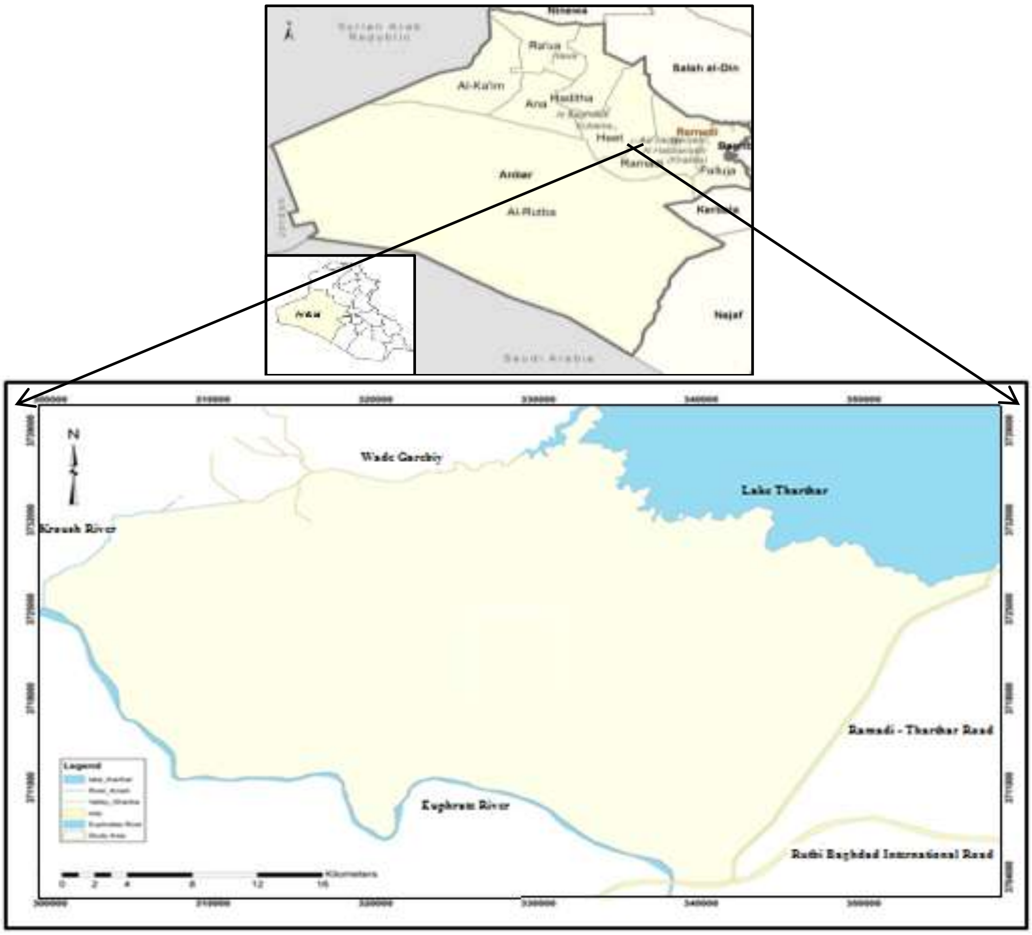

Figure 1. Map of the administrative location of the study area.

Table 1. Ranges and categories of the standard precipitation index proposed by ,1993) McKee etal.(

Classification	SPI values
Very high humidity	2≤
high humidity	1.50- 1.99
Average humidity	1.00-1.49
Moderate humidity	0 -0.99
Moderately dry	-0.99 – 0
Average dryness	-1.00 - -1.49
Very dry	-1.50 - -1.99
Very very dry	-2≤

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.2.3Field procedures

After conducting a cartographic analysis of the digital elevation visualization of the study area (DEM), which was obtained from the ALOS PALSAR satellite (Figure 2) and as shown in Table (2). The number of squares for the study was chosen based on the area of each elevation range above sea level, amounting to 61 modeling sites (Figure, 2.(

The natural vegetation was characterized, and its type, density, and frequency were determined to identify the nature of the variations occurring in it, and the plant species present in the study area during the four seasons (spring, summer, fall and winter) for the year 2023 were identified, by taking plant samples and identifying their types using parts of the Iraqi flora as a reference, as for the unidentified species, they were collected, dried, and later classified using the National Herbarium.Some characteristics of the plant community were analyzed using quantitative methods using the random quadrate method with dimensions of 2 m x 2m based on what was proposed by (1959,Cain), as suggested by (1974, Mueller), then the following characteristics of the natural plant were estimated according to the methods presented in (1980, Barbour.(

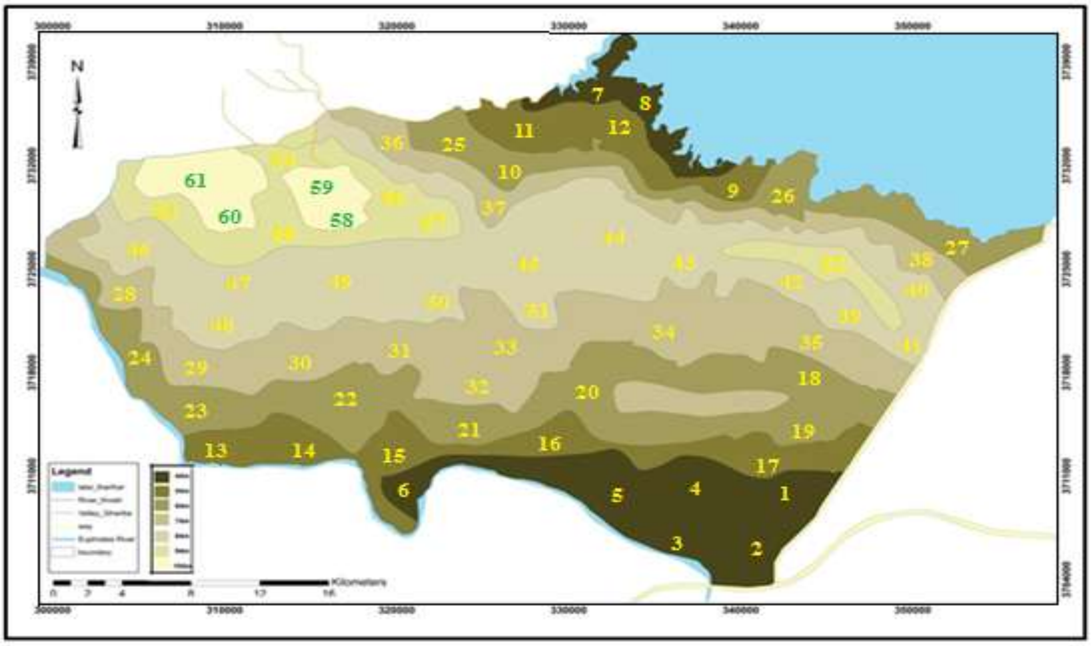

Figure 2. Digital elevation map of the study area and modeling sites for natural vegetation.

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Table 2. Cartographic analysis of the digital elevation map of the study area and what it constitutes as a percentage of the area.

The elevation range (m)	The Area (ha)	The percentage from total Area	Number of squares
44-54	12786.23	10.98	8
54-64	12833.43	11.02	9
64-74	24139.93	20.72	10
74-84	25777.93	22.13	11
84-94	27683.89	23.76	13
94-104	8753.88	7.51	6
>104	4516.31	3.88	4
Total	116491.60	100	61

The number and types of plants present within each square, along with measuring the height and width of the vegetative cluster of each plant.

Density according the fallowing equation

Density=(The number of individuals of one species)/(the total number of squares) ……(1(

.4 Frequency of occurrence=(Number of plants of the particular species)/(The total number of squares)*100 …..(2(

.5Abundance=(Number of plants of the particular species)/(The total number of individuals of all species in the study sample) …..(3(

.6Coverage is the area covered by the vegetative part of any plant species and is measured on the basis of the area of an ellipse according to the following formulas:

Crown cover = 1/4 π D1D2 ….(4(

Crown volume = 1/6 πD1D2h …..(5(

Where D1 and D2 are the diameters of the vegetative part and h is the height of the vegetative part.

.7Biomass represents the weight of the natural plant per unit area, the harvest method was used to estimate it, according to (1961, Chapman.(

Then the plant species in the region were compared with the results of (1966, Guest) in Iraqi flora and the maps prepared by him for each identified plant species.

The satellite image of the study area for the year 2023, which was taken during the month of April, was obtained from the USGS website)https://earthexplorer.usgs.gov) and includes Landsat 8 satellite data, according to system path (Path) 169 and row (Row) 37, and displayed on the area Universal Transverse Mercator (UTM (38N on reference WGS84. The video was downloaded in tagged image file format (Geo TIFF), and the study area was cropped from it, using ArcGIS 10.8. Near-infrared vegetation analysis was used The red bands derived from satellite visuals were calculated according to the following equation proposed by (1974, Rouse:(

"NDVI=" "(NIR-R)" /"NIR+R)" " …..(6 "(

Whereas:

NIR= Near Infrared Band (0.77 µm – 0.9 µm(

R = Visible red band (0.63 µm – 0.69 µm (

The value of NDVI ranges between (-1, 1), and the closer the value is to 1, this is evidence of the density of vegetation in the area.

The results

The climate

It was observed from Figure 3 the presence of a linear regression with a highly significant correlation in the average temperature of the region, at a rate of 2°C for the period from 1980 to 2022. This increase in temperature was accompanied by a clear linear decrease according to the equation Y = 150 -0.0217X, which was negatively reflected in the amount rainfall decreased from 150 mm to 90 mm for the years 1980 and 2022, respectively, with a clear fluctuation in the amounts of rainfall falling below the general average of 122 mm for 42 years, interspersed with periods of moderate humidity, especially in the period 1999 - 1994, when the amount of rainfall exceeded the average annual rainfall. In the area (Figure 4.(

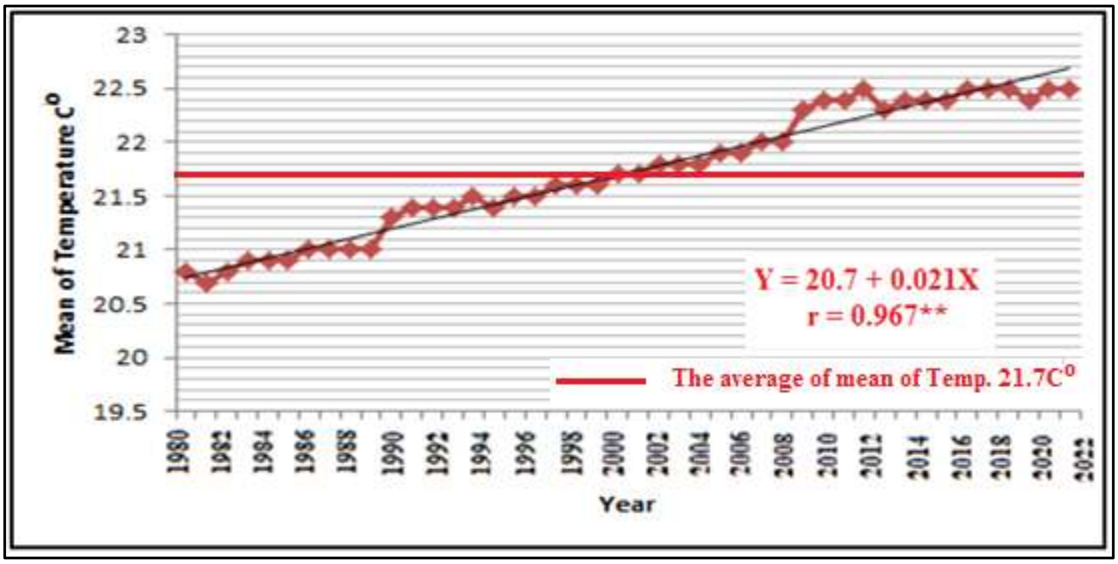

Figure 3. Variation in average annual temperatures at Ramadi monitoring station over the period from 1980 to 2022.

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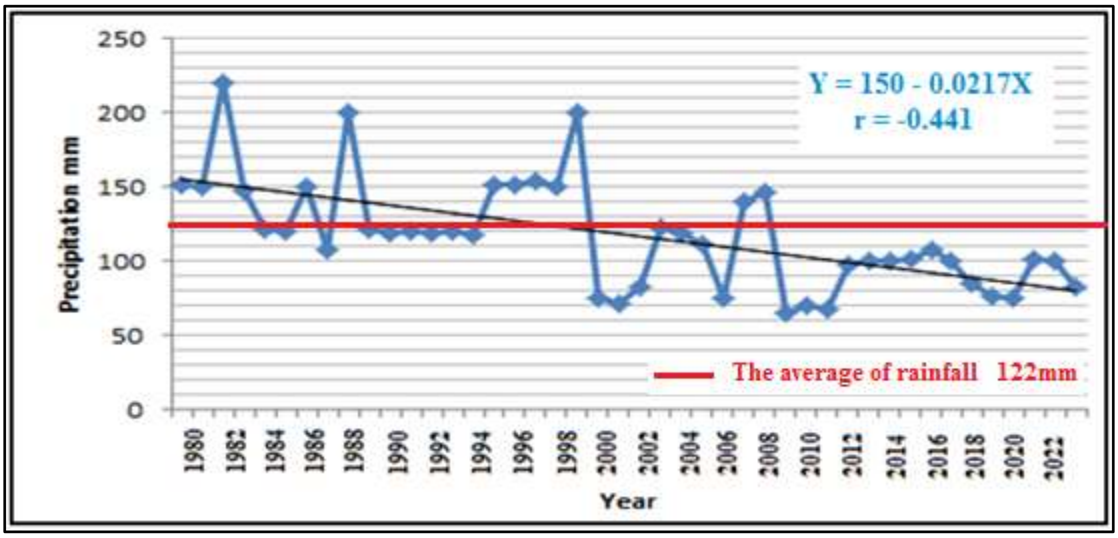

Figure 4. Variation in the amount of rainfall falling annually at the Ramadi monitoring station during the period from 1980 to 2022.

Based on the analysis of the moving average of precipitation for the reference period (Figure 6), it was found that the governorate had begun to suffer from apparent drought in the year 2000 and this continued until the year 2003 and then from 2009 until 2022. It was also found that the total rainfall that fell during 12 years for the period from 2000 until 2011 had decreased significantly, about 25% of the total rainfall witnessed in the same time period preceding the year 2000. This is agreed with (2019, Abed) who studied the impact of climate change on the temperature and rainfall of Iraq, for the period from 1926 to 2010. (2016, Al-Mohammadi) indicated an inverse effect between the decrease in the water level of Habbaniyah Lake and the increase in the rates of temperatures witnessed in Anbar Governorate

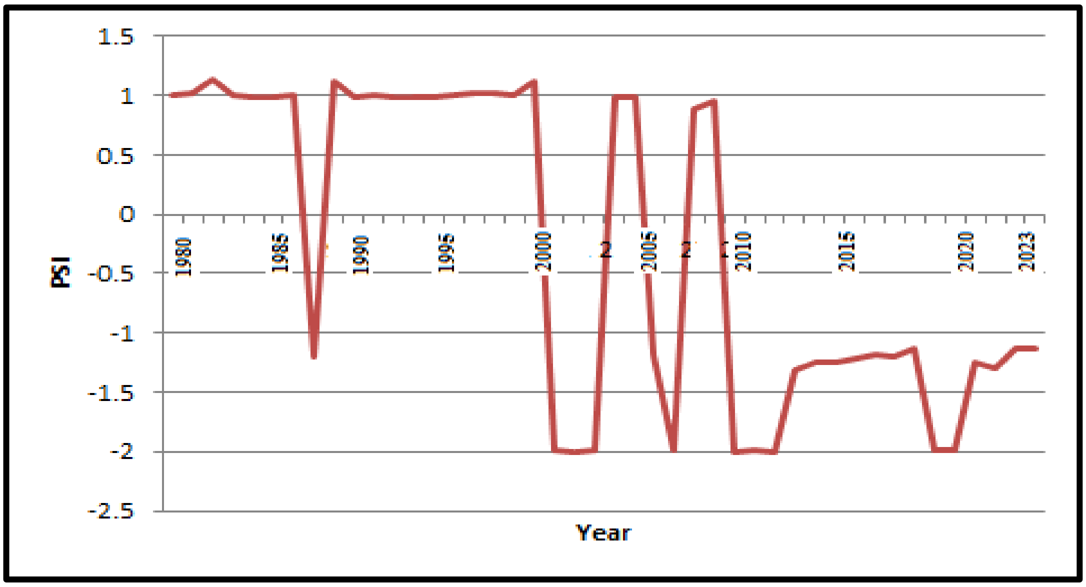

Figure 6. 5-year moving average chart of precipitation for the study area.

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The 5-year moving average of precipitation (Figure 6) shows that there is a decrease in precipitation values that is less than the average precipitation for the long-term reference period. The current climate conditions are constantly changing, which leads to making the region more vulnerable to a decrease in rainfall, which requires taking all necessary measures. To address this problem and reduce its potential risks very effectively. (1993, McKee) explained that the duration of the drought begins when the SPI values are negative and is maximum when it becomes -2, and the drought duration ends when the SPI values rise and are positive.

The use of the M-K testis Sen,s slope reached -0.019*** based on the trend coefficients of Sen,s slope and ß in the M-K methods using the (2017, XLSTAT) and (2016, M.Excel) programs, indicating the presence of variation in trends, and the table 3 It shows the severity and frequency of drought in the study area using the SPI index. It is noted that moderate humidity recorded the highest frequency in the region at a rate of 46.5%, while moderate humidity recorded the lowest frequency at a rate of 4.7%, while drought in all its forms recorded the highest frequency during the period from 1980 to 2023.

Table 3. Classifications of drought severity and frequency in determining the frequency of dry and wet years using the SPI index

Classifications of drought severity									
Medium humidity		Moderate humidity		Medium dry		Extremely dry		Very extremely dry	
%	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency
46.5	20	4.7	2	11.6	5	11.6	5	25.6	11

It has been observed that there is an increasing frequency of years of climatic drought in the region. Because rain (from which drought is derived) is an oscillating element and a discrete phenomenon, its annual quantity is governed by atmospheric dynamics that may not follow any periodicity in similarity or repetition. What confirms the importance of these results is that they were relatively similar to the trends observed in studies of the regional and Mediterranean basin in monitoring the trend, and global in monitoring the sentiment, including the study of (2013, Al-Mashagbah) in Jordan, which revealed a trend of decline appearing in 5

Monitoring station. Also, the study of (2013, Shehadeh), which showed the negative impact of the climat variabele on rainfall in the eastern Mediterranean (Jordan), and that it follows a statistical significance in the direction of its decrease. And the study of (2020, Al-Esawi), as it implicitly monitored rainfall trends in the Jifara Plain in Libya, as it was found that M-K for the period (1946-2000) was significant, and the test of temperature trends for the same period showed that M-K was significant in 12 stations out of a total of 15 stations. Therefore, we should not ignore that the rain we dealt with is the one that has all the irregular fluctuations.

.2.2 The Soil

The soil in the study area was classified according to the classification of Buringh (1960) into several types, most of them is

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occupied by gypsum desert soils, at a rate of 70.7% (82,369.1 hectares), followed by valley bottom soils, at a rate of 12.6% (14,759.4 hectares).) Then the desert salt marshes with a percentage of 7.3% (8551.1 hectares) and finally the soils of river banks and alluvial soils of river basins with a percentage of 5.1 and 4.3% (5936.7 and 5051.2 hectares), respectively.

In terms of soil salinity and its types which identified in the study area, it is noted from the figure 7and table 4 (The cartographic analysis of the salinity map) that the dominance was for class S3, at a rate of 28.49% (33,188.45 hectares), followed by the class S4, at a rate of 22.14% (25,791.24 hectares). While the S1 recorded the lowest area, amounting to 8.21% (9563.96 hectares.(

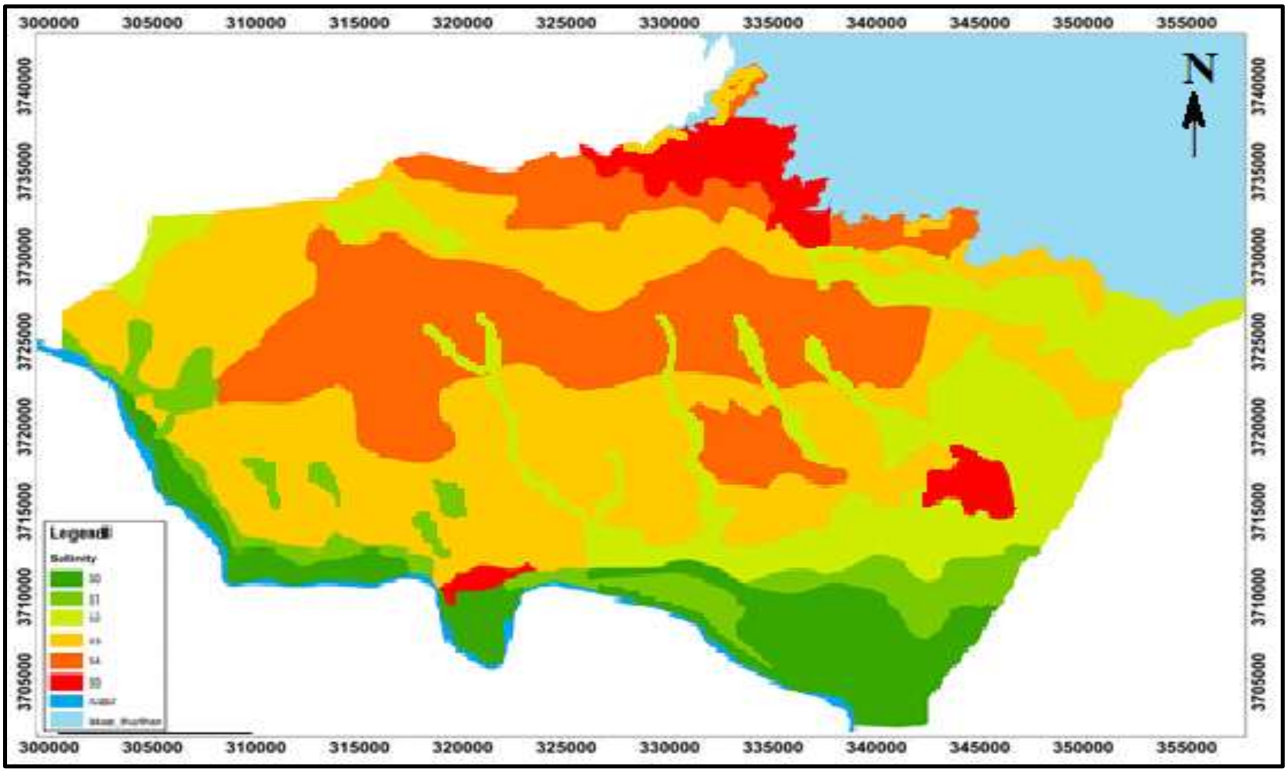

Figure 7. Spatial distribution of diagnosed soil salinity types in the study area.

Table 4. Cartographic analysis of the salinity map of the study area.

Salinity level	Percent from total area	Area(ha)
S0	12.33	14363.41
S1	8.21	9563.96
S2	18.82	21923.72
S3	28.49	33188.45
S4	22.14	25791.24
S5	10.01	11660.82

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.2.3Analysis of vegetation in the study area using the NDVI index

The purpose of this guide is to study and analyze the proportion of vegetation on the Earth's surface using near-infrared and red bands from satellite images. It is clear from the results of Figures (8 and 9) that there is variation in vegetation cover according to the NDVI, within the study area for satellite images captured during April of 1980 and 2023, as its lowest and highest values ranged between -0.1 and 0.8, so values (<0.1) indicate the presence Little vegetation cover. Values ranging between (0.1 - 0.4) indicate the presence of low-density vegetation cover representing cultivated lands, while values exceeding 0.4 indicate the presence of dense vegetation cover such as trees and orchards. Based on the method of (2010, Al-Shafi'i) the study area was divided into three categories:

-1First class(I): Barren Land (<0.1.(

-2Second class(II): Low density vegetation (0.4-0.1.(

-3Thrid class(III): High density vegetation (>0.4.(

The results of the cartographic analysis of the NDVI, Table 5 showed the presence of variation in the categories of vegetation areas. The area of barren lands (Class I) constituted a percentage of 25.61% (29,833.48 hectares) in 1980, and its percentage increased to 38.87% (45,280.28 hectares) during the year 2023(Table 6), while lands with low-density vegetation (Class II) constituted the highest percentage, amounting to 47.21%. (42,111.69 hectares), decreased to 36.15% (54,995.68 hectares) in 2023, while the percentage of lands covered by dense vegetation (Class III) occupied a rate of 38.24% (44,546.43 hectares) in 1980, decreasing to 13.92% (16,215.65). hectares) in 2023. The high percentage of lands class I and class II, may be due to the region being exposed to many security crises that forced people to leave their homes and agricultural lands as a result of the conditions that struck the region, as well as the variation in The climatic factors represented by high temperatures, increased evaporation, and scarcity of rainwater cause an increase in the area of barren lands, and this is consistent with what (2010, IOM) stated when he studied the lands of the Saqlawiyah district adjacent to the study area.

It is also noted from the figure 9 that the vegetation cover is widespread in the southern and eastern parts of the study area, and its disappearance in the northern part of it, and this is attributed to its distance from the water sources represented by the Euphrates River, and despite the farmers in those areas resorting to digging wells and using modern irrigation methods, represented by center-pivot irrigation systems, as shown by field observations, but no improvement was observed in the density of plant cover .

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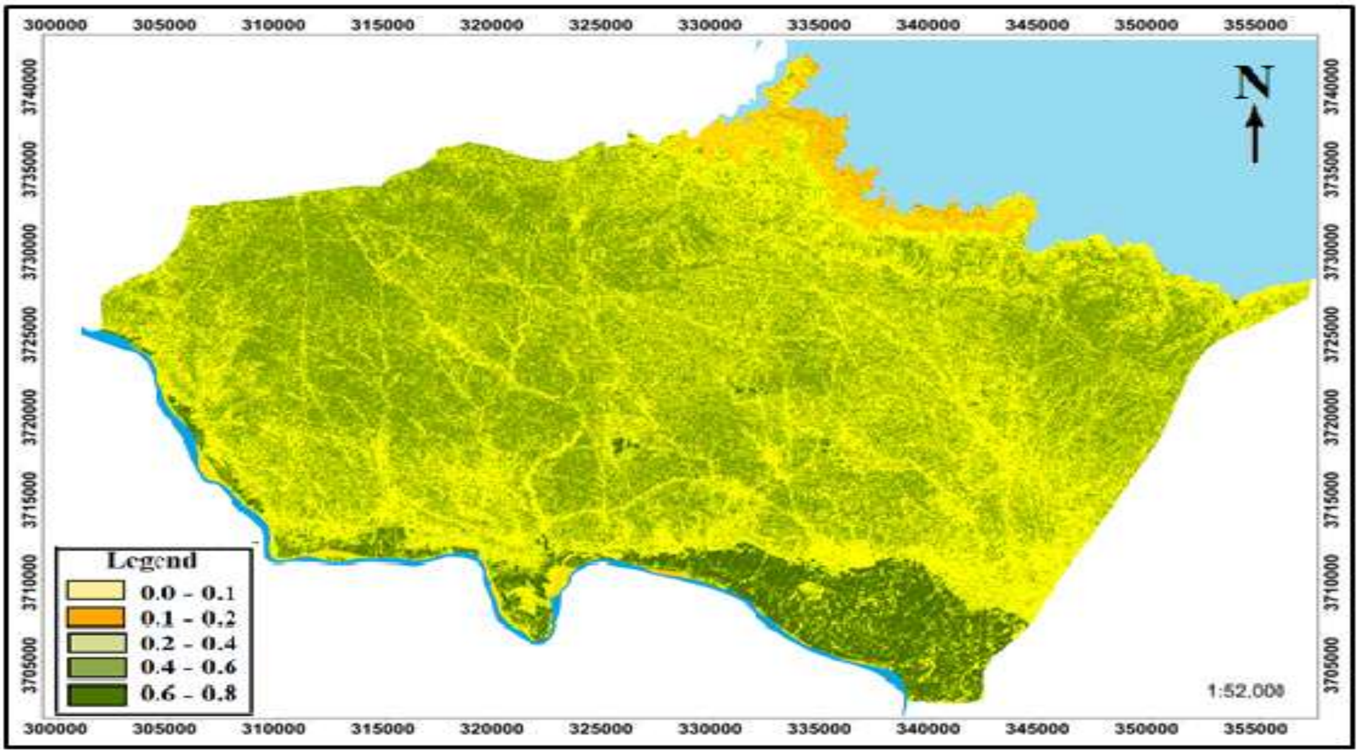


Figure 8. NDVI analysis of the 1980 satellite image.

Table 5. Cartographic analysis for the 1980 image

Percent	Area(ha)	NDVI
19.21	22378.02	-0.11 - 0.00
6.40	7455.46	0.01 - 0.10
36.15	42111.69	0.11 - 0.40
29.21	34027.18	0.41 - 0.60
9.03	10519.25	0.61 – 0.80

Figure 9. NDVI analysis of the 2023 satellite image.

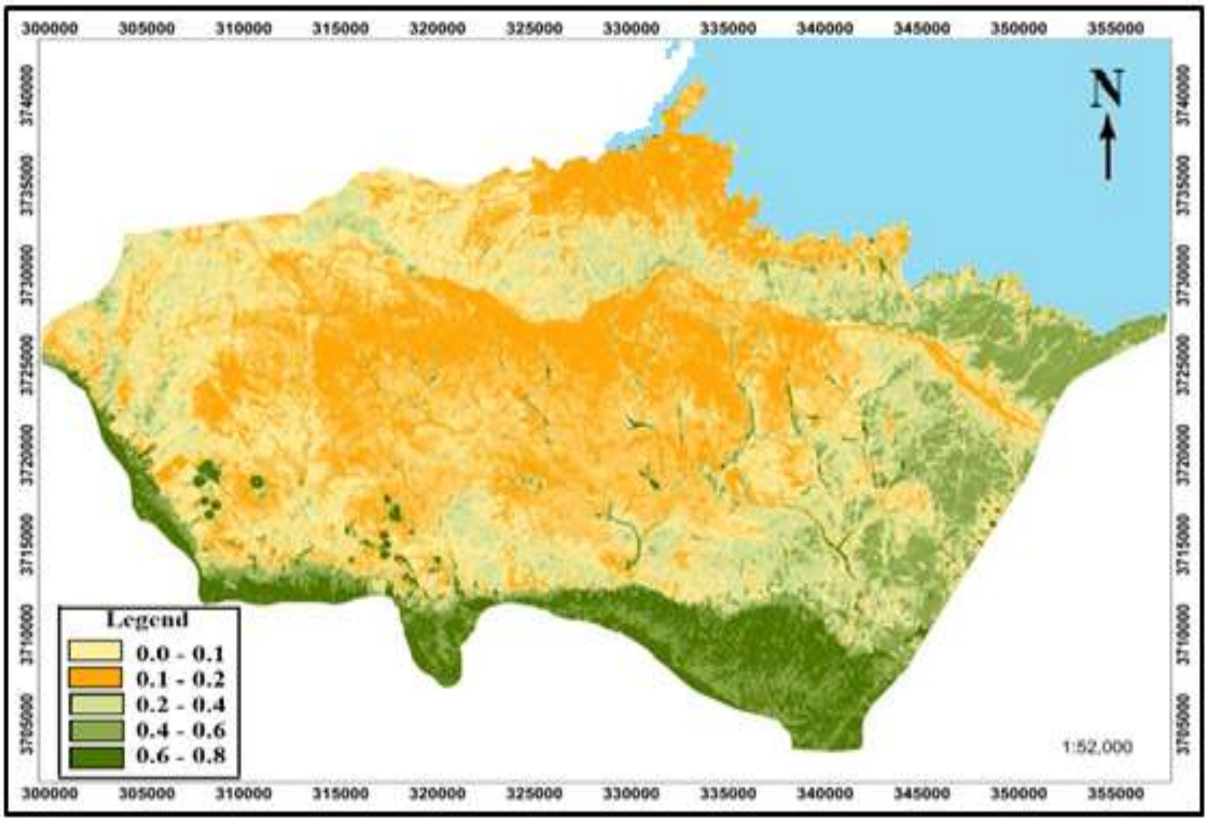
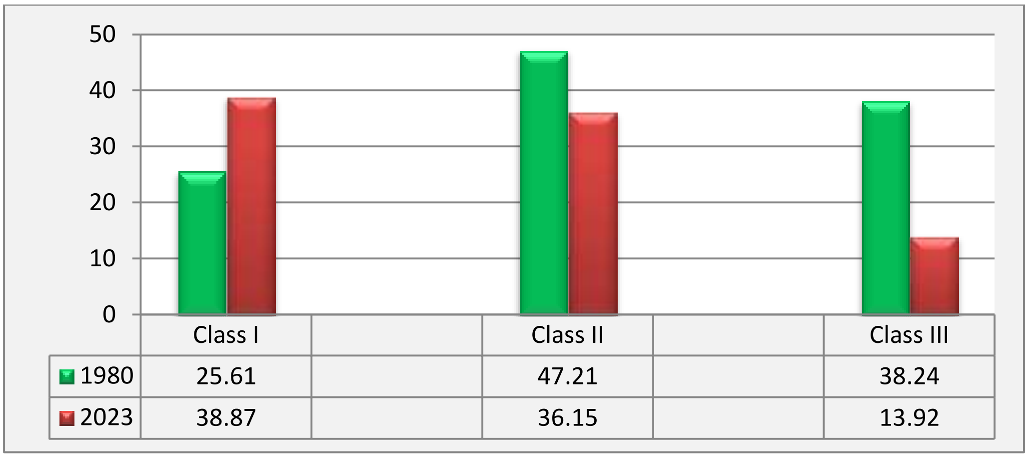


Table 6. Cartographic analysis for the 2023 image.

Percent	Area(ha)	NDVI
9.47	11031.75	-0.11 - 0.00
29.40	34248.53	0.01 - 0.10
26.15	30462.55	0.11 - 0.40
21.06	24533.13	0.41 - 0.60
13.92	16215.65	0.61 – 0.80

Its observed from Figure (10), which shows the variation in the types of vegetation over 43 years, is an increase in Class I by 13.26%, compared to a decrease in Classes II and III, 11.06% and 24.38%, respectively. Which indicates that the climate variation recorded in the region had a clear impact on the vegetation in the region



.Figure 10. Variation in NDVI classes between the two years of the study

.2.4Ecosystem analysis within the study area

Exploratory tours and field studies of the environment of the study area showed that the natural vegetation in this area is wild plants, consisting of:

A- Perennial and annual shrubs: The majority of shrubs spread in this environment belong to the saprophytic family (Chenopodiaceae), as they are considered woody or semi-woody plants. They are useful for grazing in the summer and fall when the herbs disappear. They are also salt-resistant succulent plants, and most of them are resistant to drought conditions, by changing its leaves into scales, or by containing a dense root system deep in the ground, or by wrapping its leaves around each other to reduce transpiration.

B- Annual grasses and herbs: This group of plants completes their life cycle in a short period of time, beginning during the month of October and ending in April, which is the specific season for rainfall, during which the plants grow, flower, and form their seeds before the weather becomes hot.

The following is a description of the natural vegetation present in the study environment:

It is showed from the figure 11 that there is a difference between the secondary

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physiographic units in terms of the percentage of identified plant species. Perennial plant species recorded the highest percentage among all the physiographic units, with a percentage ranging between 26.1-40.4%, the lowest percentage was recorded in unit LB, while the highest percentage was in unit HB is followed by Seasonal herbswith a percentage that ranged between 29.0-36.9% at the units D and LB, respectively.

As for the third place, it was for perennial herbs, with a percentage ranging between 19.2-28.3% at both the physiological units HB and LB, respectively, while the lowest percentage was for annual legumes, with a percentage ranging between 6.5-8.7% recorded at the two units D and LB, as can be seen from the figure 11. The percentage of perennial plants recorded the highest percentage in terms of dominance, as it ranged between 54.4-64.5%, compared to annual species whose percentages ranged between 35.5-45.6%.

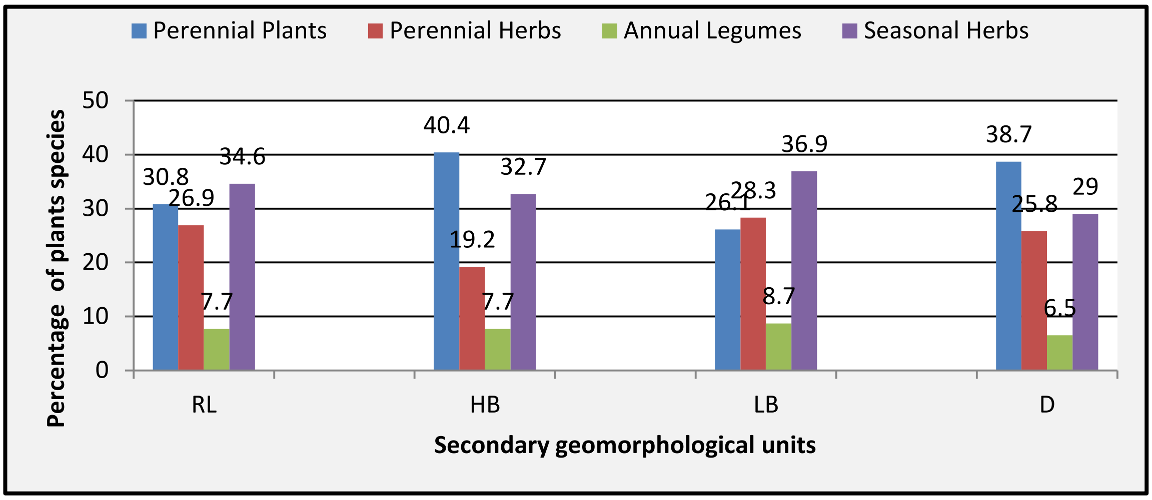

Figure 11.Percentage of plant species which was identified in secondary physiographic units in the study area.

The study of plant species and their percentages in the total showed that the perennial species were distributed as follows: Herba-alba Asso constituted 100%, followed by Halocnemum strobilaceum and Achillea fragrantissima Artemisia with 87.5% in D unit, while dominance was in the LB unit for Atriplex ieucoelada Boiss with a percentage 70.8%, followed by the Herba-alba Asso plant with a percentage 66.7%, while HB unit was the dominance for plant Haloxylon salicornicum by 80.0%, followed by Tamarix ramosissima plants, Alhagi mauroram, Salsola rigida Pall and Astragalus spinousus at a rate of 70.0%, while in the RL Physiographic Unit RL it was for Camphorosma monspeliaca and Tamarix ramosissima at 80.0%, followed by Prosopis farcta and Alhagi mauroram 70%. While Anabasis articulate and Salix exigua recorded the lowest percentage 37.5% in D unit, while unit LB recorded the lowest presence of Fagonia laevis at 12.5%, and in unit HB Kraschenninkovia ceratoides plant recorded the lowest percentage 30%, while the physiological unit RL Plants Camphorosma monspeliaca and Ziziphus nummularia recorded the lowest percentage 40%, as shown in the figure 12 .

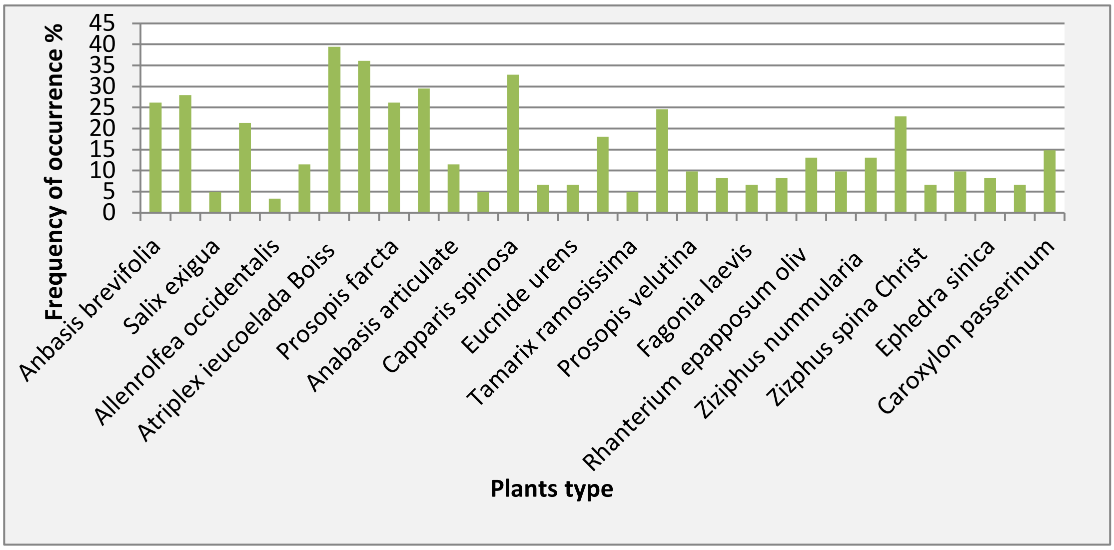

Figure 12. Total frequency of perennial plants in the study area.

As for perennial herbs(Fig.13), plant Carthamus oxycanthus showed dominance with a frequency 62.5%, followed by Susaeda spp. with a frequency 50% within physiographic unit D, while Susaeda Spp. Was the dominance by 50%, followed by Carthamus oxycanthus , Stipa spp. and Cynddon dactylon L., with a percentage 37.5% in the unit LB, while the physiological unit HB was dominated by Stipa spp. with a frequency 70%, followed by the plants Sisymbrium irio, Enneapogon desvauxil, and Carthamus oxycanthus, with a frequency 60%, while it was noted that Cynddon dactylon L. constituted the largest percentage, reaching 70%, followed by Carthamus oxycanthus, with a frequency 60%, while the plant Hirschfeldia incanal was recorded within the unit D, with the lowest frequency reached 12.5% .

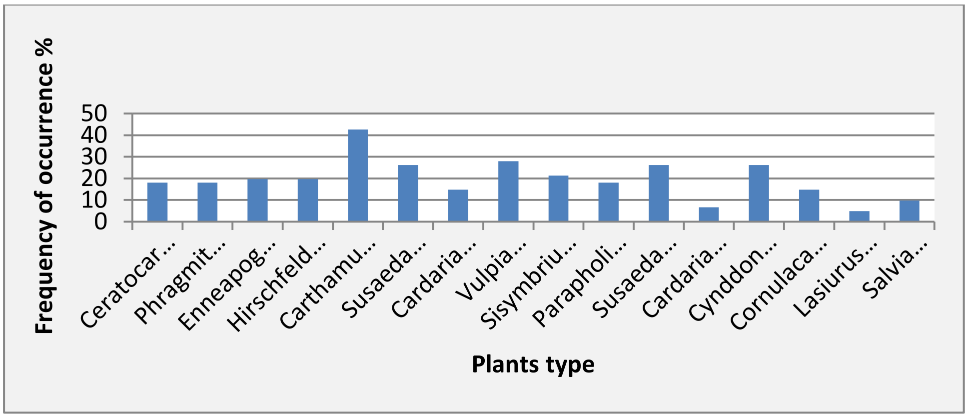

Figure 13. Relative frequency of perennial herbs plant species in the study area.

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As for annual legumes, it is noted from the table (7) that Rumex vesicarius L. recorded dominance in unit D by 75%, Onobrychis lanata 41.7% in unit LB, while Helianthemum lippi L. was dominant in unit HB (70%), as for the RL unit, the Medicago littoralis plant recorded the highest frequency at 40%. While the lowest presence was recorded for the species Medicago littoralis, Medicago laciniata L. and finally Helianthemum lippi L. for the physiographic units D, LB, HB and RL, respectively. Which indicates the influence of micro-climatic conditions within each physiographic unit on the growth and spread of plant species, as shown in the figure 14 ..

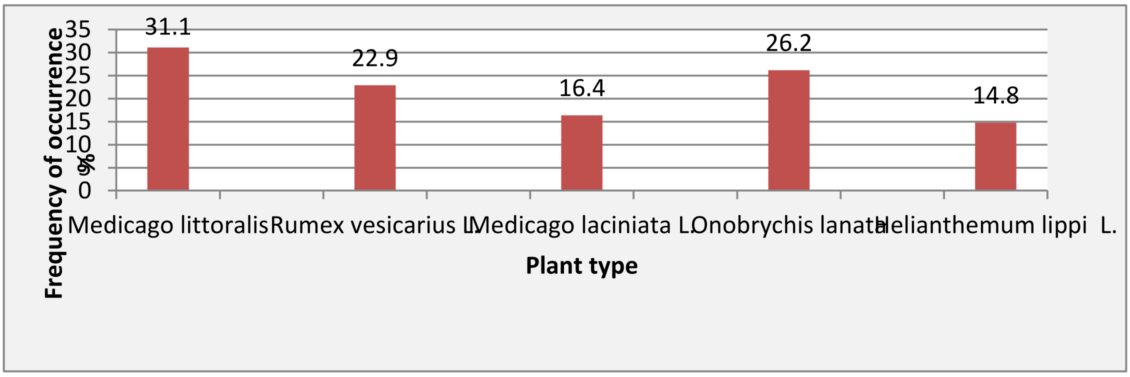

Figure 14. Relative frequency of annual legumes plant species in the study area.

As for the nature of the frequency of plant species, it is noticeable from the figure 15 that Achillea fragrantissima was recorded the highest frequency, reached 100%, while the lowest frequency was for Camphorosma monspeliaca, which reached 9.8%. As for perennial herbs, it is noticeable from the figure 15 that Stipa spp. and Cynddon dactylon L were the dominant at a rate 70%, while Hirschfeldia incanal recorded the lowest frequency 12.5%. The annual legumes showed dominance of Rumex vesicarius L. with a frequency of 75%, while Helianthemum lippi L. had the lowest frequency.

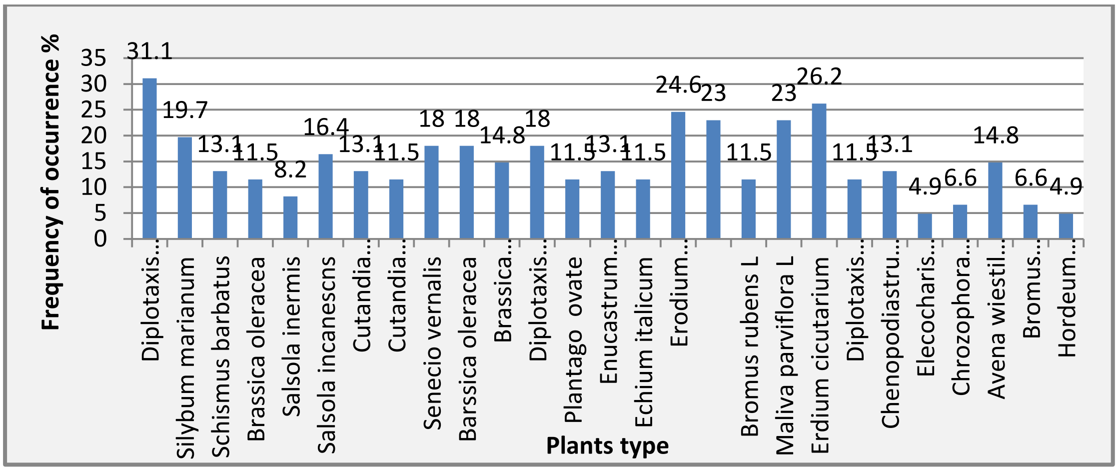

Figure 15. Relative frequency of seasonal herbs plant species in the study area.

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Regarding abundance, it is noted from the table 7 that for perennial plants, the Herba-alba Asso plant recorded the highest abundance, reaching 15.6%, compared to 2.2% for the Anabasis articulate plant at physiographic unit D, while the LB unit showed dominance in abundance for the Atriplex ieucoelada Boiss plant, at a rate of 16.9%, which is the perennial shrubs found in such dry environments, they are resistant to drought and are important in terms of palatability, especially for camel, while the lowest plant abundance was recorded at 2.6% for Fagonia laevis, but the secondary physiographic unit HB was the abundance of Haloxylon salicornicum, Astragalus spinousus, and Alhagi mauroram. Abundance rates reached 7.1%, 7.2, and 7.3%, respectively, while the lowest abundance was for Krascheninnikovia ceratoides, at 2.8%. The physiographic unit RL was the abundance of Tamarix ramosissima and Salsola rigida Pall. by 22.2% and 21.2%, respectively.

The lowest abundance was for Camphorosma monspeliaca, which reached 9.8%. It is noted from the results of table 7 for this plant indicator that the abundance was greater for species identified at the secondary physiographic unit RL compared to unit HB, and this is due to the availability of moisture within the lower physiographic units, which provides appropriate conditions for the growth of plant species, the emergence of Susaeda Spp. In this environment, was an indication of its presence in an environment other than its own, as it is one of the plants that spread in most of the Iraqi lands located within the sedimentary areas and close to the banks of rivers and salty lands (1966, Guest). Its movement to the region may be due to grazing because it is a plant that is palatable to camels because it contains high levels of water and belongs to the

Table 7. Types of plants identified within the physiographic units and their quantitative indicators.

Physiographic unit	The scientific name		in which the plant type	Frequency within a physiographic unit %	Abundance %	Density (Plant m^2)	Coverage		Biomass (gm^2)	Total biomass(Plant m^2)
							Crown Cover (m^2)	Crown volume (m^3)		
D(8)	Perennial plants	*Anbasis brevifolia*	4	50.0	7.0	1.2	0.017	0.0011	6.9	2156.4
		Camphorosma	5	62.5	8.9	0.3	6	0.0628	212.8	
		monspeliaca	3	37.5	1.8	0.5	0.377	10.642	33500.	
		Salix exigua	5	62.5	9.2	1.2	1	4	3	
		Arundo donax	2	25.0	3.5	1.0	6.282	0.0039	275.0	
		Allenrolfea occidentalis	7	87.5	13.	0.6	1	0.0021	20.4	
		Achillea fragrantissima	8	100.	4	0.3	0.002	0.0050	208.0	
		Artemisia herba-alba	5	0	15.	0.6	1	0.0130	300.0	
		Asso	6	62.5	6	2.1	0.031	0.1047	2110.2	

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		Atriplex ieucoelada Boiss *Schanginia aegyptiaca* *Prosopis farcta* *Halocnemum strobilaceum* *Anabasis articulate*	6 7 3	75.0 75.0 87.5 37.5	9.7 10.9 11.3 13.9 2.2	1.4 8.2 1.1	4 0.0400 0.0590 0.3141 0.0201 0.1300 0.0038 0.0078	0.0033 0.0220 0.0004 0.0010	10.2 36.3 6.1 8.2	
	Perennial herbs	*Ceratocarpus arenarius*	3	37.5	15.0	3.2	0.0283	0.0032	10.2	
		Phragmites australis	3	37.5	15.5	0.8	0.0022	0.0033	253.2	
		Enneapogon desvauxi	2	25.0	9.5	1.3	0.0172	0.0031	4.1	
		Hirschfeldia incanal	1	12.5	4.6	1.4	0.1586	0.0069	45.8	
		Carthamus oxycanthus	5	62.5	27.8	3.2	0.0044	0.0006	4.8	
		Susaeda Spp.	4	50.0	21.0	3.1	0.0191	0.0030	9.5	
		Cardaria draba L.	3	37.5	16.2	2.1	0.0019	0.0001	3.6	
		Vulpia fasciculate	2	25.0	9.2	3.5	0.0007	0.2091	14.4	
	Annual	*Medicago littoralis*	5	62.5	28.4	8.2	0.0079	0.0008	4.6	
		Rumex vesicarius L.	6	75.0	32.7	1.1	0.0480	0.0100	177.0	
	Seasonal herbs	*Diplotaxis erucoides* *Silybum marianum* *Schismus barbatus* *Brassica oleracea* *Salsola inermis* *Salsola incanescns* *Cutandia memphitica* Cutandia dicotoma *Senecio vernalis*	3 4 3 7 5 3 2 2 4	37.5 50.0 37.5 87.5 62.5 37.5 25.0 25.0 50.0	15.8 21.6 15.0 23.8 17.7 14.1	0.3 4.2 1.1 0.3 0.2 0.3 2.6 3.1 0.4	0.4096 0.0019 0.0176 0.0100 0.0141 0.0132	0.1025 0.0002 0.0008 0.0012 0.0009 0.0018 0.0002 0.0002 0.0014	246.3 7.2 7.3 27.2 25.8 36.6 1.8 3.0 8.4	

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					7.5 7.9 19. 2		0.001 7 0.001 9 0.008 6			
I.B (24)	Perennial plants	*Anbasis brevifolia* *Xylosalsola arbuscula* *Camphorosma monspeliaca* *Arundo donax* *Condea emoryi* *Prosopis velutina* *Fagonia laevis* *Artemisia herba-alba* Asso *Atriplex ieucoelada* Boiss *Schanginia aegyptiaca* *Prosopis farcta* *Astragalus spinousus*	12 12 8 8 5 4 3 16 17 10 12 13	50.0 50.0 25.0 25.0 20.8 16.7 12.5 66.7 70.8 41.7 50.0 54.2	11. 4 11. 8 7.3 8.0 4.4 3.8 2.6 15. 7 16. 9 9.3 11. 7 12. 6	10. 1 0.5 1.2 1.1 3.2 9.1 0.2 1.1 0.2 1.4 3.2 2.2	0.017 6 0.007 9 0.377 1 0.002 1 0.009 4 3.145 2 0.502 4 0.059 0 0.314 1 0.020 1 0.130 0 0.031 4	0.0011 0.0008 0.0628 0.0040 0.0008 10.466 1 0.2177 0.0130 0.1047 0.0033 0.0220 0.0691	6.4 6.7 212.8 272.3 4.8 32460. 5 430.9 300.0 2110.2 10.2 36.3 143.4	1420. 5
	Perennial herbs	*Ceratocarpus arenarius* *Sisymbrium irio* *Phragmites australis* *Enneapogon desvauxil* *Parapholis incurve* *Hirschfeldia incanal* *Carthamus oxycanthus* *Carthamus oxycanthus* Susaeda Spp. Stipa spp. Cardaria draba L. *Cynddon dactylon* L. *Vulpia fasciculate*	8 7 5 4 8 5 9 12 9 6 4 9 7	33.3 25.9 20,8 16.7 33.3 20.8 37.5 50.0 37.5 25.0 16.7 37.5 25.9	9.6 8.2 5.7 4.5 10. 0 6.0 10. 5 14. 8 10. 3 6.9 4.8 11. 0 8.1	1.2 3.4 1.2 4.1 15. 3 11. 1 2.5 3.1 5.1 3.4 3.0 12. 1 6.2	0.028 3 0.010 2 0.002 1 0.017 0 0.006 3 0.158 6 0.004 4 0.020 5 0.439 6	0.0030 0.0013 0.0034 0.0031 0.0003 0.0064 0.0007 0.0030 0.1904 0.0001 0.0016 0.0208 0.2080	9.8 4.9 255.0 4.4 1.8 45.1 5.1 10.4 215.6 3.6 15.6 55.7 14.1	

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							0.001 7 0.007 9 0.628 2 0.000 7			
	Annual legumes	*Medicago laciniata* L. *Onobrychis lanata* *Medicago littoralis* *Rumex vesicarius* L.	6 10 7 8	25.0 41.7 25.9 33.3	14. 0 27. 2 15. 2 14. 7	4.5 6.2 8.4 2.1	0.031 4 0.031 4 0.007 3 0.048 0	0.0004 0.0009 0.0008 0.0100	3.8 6.2 4.3 154.6	
	Seasonal herbs	*Barssica oleracea* *Diplotaxis erucoides* *Brassica tournefortii* *Silybum marianum* *Schismus barbatus* *Diplotaxis erucoides* *Plantago ovate* *Brassica oleracea* *Enucastrum nasturtifolium* *Echium italicum* *Erodium malacoides* *Chrozophora tinctorea* *Salsola incanescns* *Bromus rubens* L. *Cutandia memphitica* *Cutandia dicotoma* *Senecio vernalis*	6 10 3 4 2 6 4 12 4 5 8 9 7 5 6 5 7	25.0 41.7 12.5 16.7 8.3 25.0 16.7 50.0 16.7 20.8 33.3 37.5 25.9 20.8 25.0 20.8 25.9	7.8 13. 5 3.7 5.0 2.4 8.0 5.3 16. 8 5.1 6.3 10. 7 10. 1 9.1 6.1 7.8 6.6 9.4	7.4 1.6 2.4 5.1 6.2 10. 2 13. 1 1.4 2.3 3.2 12. 1 2.6 1.4 0.7 12. 1 2.7 4.1	0.010 3 0.407 6 0.010 4 0.001 9 0.017 4 0.005 5 0.000 4 0.010 0 0.017 7 0.013 3 0.011 3 0.013 2 0.001 9 0.001 7 0.001 6 0.001 9	0.0013 0.1027 0.0003 0.0002 0.0007 0.0001 0.0001 0.0012 0.0029 0.0029 0.0009 0.0018 0.0002 0.0002 0.0001 0.0002 0.0014	25.4 244.8 2.3 7.2 7.1 1.8 1.6 27.2 6.8 7.1 4.7 36.6 5.4 1.8 2.5 3.0 8.5	

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							0.0086			
HB (10)	Perennial plants	*Capparis spinosa*	4	40.0	3.7	3.1	0.0707	0.0211	52.3	842.9
		Xylosalsola arbuscula	4	40.0	3.8	1.2	0.0079	0.0008	6.6	
		Eucnide urens	6	60.0	4.7	3.4	0.1962	0.0523	281.1	
		Krascheninnikovia ceratoides	3	30.0	2.8	2.1	0.0315	0.0102	36.2	
		Tamarix ramosissima	7	70.0	6.7	0.5	3.1405	9.3830	43451.2	
		Condea emoryi	6	60.0	4.6	5.1	0.0094	0.0008	4.8	
		Prosopis velutina	5	50.0	4.7	2.1	3.1452	10.4661	32460.5	
		Psorothamnus schottii	4	40.0	3.6	2.0	0.7853	0.3909	60122.8	
		Fagonia laevis	5	50.0	4.8	1.2	0.5024	0.2177	430.9	
		Haloxylon salicornicum	8	80.0	7.3	0.4	0.0808	0.0053	198.5	
		Rhanterium epapposum oliv	6	60.0	4.8	0.5	0.1246	0.0255	120.5	
		Salsola rigida Pall.	7	70.0	6.9	0.3	0.0302	0.0066	85.4	
		Ziziphus nummularia	4	40.0	3.7	0.4	0.6281	0.6908	4210.3	
		Prosopis farcta	6	60.0	5.0	4.3	0.1290	0.0216	35.4	
		Alhagi mauroram	7	70.0	7.1	5.6	0.0078	0.0035	26.6	
		Zizphus spina Christ	4	40.0	3.7	1.2	0.4396	0.6158	6120.8	
		Solanaceae	6	60.0	5.1	0.3	0.0320	0.0064	235.9	
		Astragalus spinousus	7	70.0	7.2	0.7	0.0310	0.0681	140.8	
		Ephedra sinica	5	50.0	5.2	2.4	0.0290	0.0105	42.8	
		Tamarix passorinnoides	4	40.0	4.0	0.3	0.6280	0.6270	5205.2	
		Caroxylon passerinum	4	40.0	3.8	4.1	0.0314	0.0050	314.7	

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Perennial herbs	*Sisymbrium irio*	6	60.0	15.3	6.1	0.0102	0.0013	5.1
	Enneapogon desvauxil	6	60.0	14.1	2.3	0.0172	0.0035	4.4
	Parapholis incurve	3	30.0	7.1	10.3	0.0060	0.0003	1.7
	Hirschfeldia incanal	3	30.0	7.8	9.4	0.1586	0.0065	44.5
	Cornulaca monacantha	5	50.0	12.4	6.8	0.0330	0.0039	34.4
	Carthamus oxycanthus	6	60.0	15.8	3.3	0.0046	0.0006	5.3
	Stipa spp.	7	70.0	14.3	2.1	0.4390	0.1900	214.0
	Lasiurus hirsutus	3	30.0	6.6	1.3	0.0314	0.0126	56.8
	Salvia sclarea	2	20.0	4.3	1.0	0.0067	0.0020	72.5
	Vulpia fasciculata	4	40.0	9.7	3.1	0.0007	0.2080	13.8
Annual legumes	*Medicago laciniata* L.	4	40.0	14.3	1.9	0.0314	0.0004	4.3
	Onobrychis lanata	6	60.0	22.7	7.8	0.0314	0.0009	6.1
	Helianthemum lippi L.	7	70.0	23.9	5.4	0.2518	0.0055	65.8
	Medicago littoralis	3	30.0	10.4	10.2	0.0076	0.0008	4.4
Seasonal herbs	*Maliva parviflora* L.	6	60.0	4.9	3.5	0.1308	0.0225	36.3
	Erdium cicutarium	8	80.0	6.7	3.4	0.0080	0.0002	2.6
	Barssica oleracea	5	50.0	4.1	6.5	0.0108	0.0014	28.3
	Diplotaxis erucoides	7	70.0	5.9	1.2	0.4116	0.1028	252.3
	Brassica tournefortii	6	60.0	5.1	1.0	0.0106	0.0003	2.5
	Chenopodiastrum murale	4	40.0	3.3	0.4	0.0079	0.0010	5.8
	Schismus barbatus	3	30.0	2.7	0.8	0.0178	0.0008	7.6
	Diplotaxis erucoides	5	50.0	4.7	4.1	0.0058	0.0001	2.1
	Plantago ovate	3	30.0	3.0	5.2	0.0005	0.0001	1.9
	Elecocharis acicularis	3	30.0	2.8	2.1	0.0176	0.0018	3.7
	Enucastrum nasturtifolium	4	40.0	3.5	2.4		0.0001	2.4
	Echium italicum	2	20.0	1.7	1.3		0.0008	3.3
	Erodium malacoides	2	20.0	1.8	1.5		0.0031	7.4
	Chrozophora tinctoria	4	40.0	3.5	2.2		0.0002	2.8
	Chrozophora tinctorea	5	50.0	4.6	1.5		0.0013	6.6
	Avena wiestil Steud	5	50.0	5.0	3.6		0.0002	2.6
	Bromus rubens L.	2	20.0	1.6	2.3		0.0002	5.1

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							0.0113 0.0079 0.0136 0.0080 0.0113 0.0019 0.0020			
	Perennial plants	*Eucnide urens* *Camphorosma monspeliaca* *Tamarix ramosissima* *Salsola rigida* Pall. *Ziziphus nummularia* *Prosopis farcta* *Alhagi mauroram* *Caroxylon passerinum*	5 4 8 8 4 7 7 5	50.0 40.0 80.0 80.0 40.0 70.0 70.0 50.0	11.6 9.8 22.2 21.2 10.1 18.4 18.1 11.2	1.6 1.3 0.8 2.3 3.1 7.2 6.1 1.2	0.1966 0.3770 3.1422 0.0308 0.6286 0.1310 0.0084 0.0314	0.0531 0.0632 9.3842 0.0072 0.6910 0.0230 0.0040 0.0054	290.1 215.8 43551.2 85.2 4215.8 38.3 30.8 320.5	
	Perennial herbs	*Phragmites australis* *Hirschfeldia incanal* *Cornulaca monacantha* *Carthamus oxycanthus* *Cynddon dactylon* L. *Salvia sclarea* *Vulpia fasciculata*	3 3 4 6 7 4 4	30.0 30.0 40.0 60.0 70.0 40.0 40.0	10.7 9.6 14.1 16.3 24.1 14.9 13.4	3.8 6.2 3.6 5.3 10.2 1.4 1.6	0.0022 0.1590 0.0320 0.0046 0.6286 0.0072 0.0007	0.0042 0.0071 0.0044 0.0006 0.0208 0.0025 0.2090	282.4 47.4 38.0 8.8 55.7 82.5 15.2	3631.8
RL (10)	Annual legumes	*Helianthemum lippi* L. *Medicago littoralis*	2 4	20.0 40.0	4.8 5.6	3.2 5.4	0.2518 0.0080	0.0055 0.0008	65.8 4.8	

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	Seasonal herbs	*Maliva parviflora* L.	8	80.0	21.3	12.3	0.1208	0.0036	25.0	
		Erdium cicutarium	8	80.0	20.1	8.2	0.0080	0.0002	2.8	
		Diplotaxis erucoides	6	60.0	15.2	3.2	0.4096	0.1030	250.3	
		Silybum marianum	4	40.0	9.7	4.5	0.0022	0.0002	8.3	
		Chenopodiastrum murale	4	40.0	8.2	1.2	0.0080	0.0012	5.6	
		Erodium malacoides	5	50.0	12.3	10.5	0.0079	0.0002	2.8	
		Avena wiestil Steud	4	40.0	10.1	9.2	0.0020	0.0002	2.4	
		Bromus danthoniae	4	40.0	8.4	14.2	0.0005	0.0002	2.1	
		Hordeum marinum L.	3	30.0	7.1	15.2	0.0006	0.0002	2.6	

saprophytic amily Chenopodiaceae. As for the presence of Haloxylon salicornicum in this environment, it agrees with (1966, Guest) , it is found in environments with sandy loam soils on a compact layer of gypsum accumulated below the soil surface is consistent with the observation of (2016, Al-Mohammadi), who indicated the presence of this plant in the western region of Iraq. The reason for the dominance of Alhagi mauroram and Prosopis farcta plants in the environment of the island plateau is due to the fact that its soil is of moderate salinity, well-drained, and has good fertility, and the dominant texture type of its soil is moderately soft. This is consistent with who indicated in terms of the suitability of such conditions for the growth of Alhagi mauroram and Prosopis farcta. explained that one of the main means for the reproduction of Prosopis farcta in the desert areas of Iraq is through animals that eat the seeds during grazing and excrete them with their droppings due to their hardness and inability to digest them, then they germinate after the rain falls. They also have the benefit of adding some organic materials for the soil after its leaves fall during the summer, as for perennial herbs, it is noted from the results in table 7 Carthamus oxycanthus recorded the highest abundance, reaching 27.8% at the physiological unit D, followed by the Cynddon dactylon L. at 24.1% at the secondary physiological unit RL, while the lowest percentage of abundance in the region was recorded of Salvia sclarea, Enneapogon desvauxi and Hirschfeldia incanal.by 4.3%, 4.5%, and 4.6%, respectively, at the physiographic units HB, LB, and D, respectively. The presence of these plant species in this environment is due to their common presence in fields and farms, as well as in the western desert with mixed soil, as they flower during the last half of the month of February to April and provide good green pastures for animals .

As for the annual legumes identified in the study area, Rumex vesicarius L., Onobrychis lanata, Helianthemum lippi L., and Medicago littoralis were dominant, with abundance

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reaching 32.7%, 27.2%, 23.9%, and 5.6% for plant species, respectively.

Studying the abundance of seasonal plant species present in the study area, which was Barssica oleracea, Maliva parviflora L. and Erdium cicutarium, which indicates the presence an effect of the physiographic location on the abundance of plant species of seasonal herbs. While the plants Cutandia memphitica and Cutandia dicotoma recorded the lowest abundance at D unit, amounting to 7.5% and 7.9%, respectively, the plant Schismus barbatus was the least abundant at LB unit reached 2.4%.

As for the plants Bromus rubens L., Echium italicum, and Erodium malacoides, the lowest abundance was recorded at HB unit, at a rate of 1.6%, 1.7%, and 1.8%, respectively. While the seasonal herbs Hordeum marinum L. recorded the lowest abundance 7.1% at RL unit. The variation in the abundance of seasonal herbs between secondary physiographic units may be attributed to the nature of agricultural exploitation and the effect of agricultural operations in removing many seasonal herbaceous plant species in the long term. This was noted by (2011, Al-Bayati) when they studied the analysis of the ecosystem of some desert oases in the west. Iraq from 1966 until 2008.

Study of plant density within the study area showed a clear variation in plant density depending on the secondary physiographic unit. Study of perennial plants in unit D showed the dominance of Halocnemum strobilaceum (8.2 plants/m2), while the lowest plant density of 0.3 plants/m2 was recorded by Artemisia herba-alba Asso and Camphorosma monspeliaca. As for the secondary physiographic unit LB, Anbasis brevifolia dominated with a plant density of 10.1 plants/m2, while Atriplex ieucoelada Boiss and Fagonia laevis showed the lowest plant density, amounting to 0.2 plants/m2. As for the study of the density of perennial plants in the HB physiographic unit, it was the dominance of Alhagi mauroram was 5.6 plants/m2, while the lowest density of 0.3 plants/m2 was recorded for Salsola rigida Pall plants. The Solanaceae and Tamarix passorinnoides, while the dominance in plant density of these species was at RL for Prosopis farcta (7.2 plants/m2), the lowest density of 0.8 plants/m2 was recorded for Tamarix ramosissima.

Study of perennial herbs indicates the dominance of Vulpia fasciculata, Parapholis incurve and Cynddon dactylon L. had plant densities of 3.5, 15.3, 10.3, and 10.2 plants/m2 for physiographic units D, LB, HB, and RL, respectively, while the lowest density was for the plant species Phragmites australis (0.8 plants/m2), Ceratocarpus arenarius, and Arundo donax (1.2 plants/m2) and Salvia sclarea (1.0 plants/m2) and Salvia sclarea (1.4 plants/m2) for the same physiographic units, respectively. As for annual legumes, it is noted that Medicago littoralis recorded the highest plant density at unit D, amounting to 8.2 plants/m2, while Rumex vesicarius L. showed the lowest density, amounting to 1.1 plants/m2. As for unit LB, the density of Medicago littoralis was dominant at 8.2 plants/m2, while Rumex vesicarius L. recorded the lowest density, amounting to 2.1 plants/m2. The study of plant density of annual legumes at unit HB indicated that Medicago littoralis was dominant with a density of 10.2 plants/m2 compared to Medicago laciniata L., which recorded the lowest density of 1.9 plants/m2 .

As for the plant density of seasonal herbs, Silybum marianum was dominant and Plantago ovate, Barssica oleracea, and

Hordeum marinum L., with plant densities of 4.2, 13.1, 6.5, and 15.2 plants/m2 for the physiographic units D, LB, HB, and RL, respectively. Compared to the lowest density of plants: Salsola inermis, Bromus rubens L., Chenopodiastrum murale, and Diplotaxis erucoides, reached 0.2, 0.7, 0.4 and 3.2 plants/m2.

The observed variation in plant density and species with varying physical location is due to the soil factor, which is one of the factors influencing vegetation cover,what matters to plants is the amount of moisture stored in the soil, and the relationship between the nature of the land scape and vegetation cover is considered crucial for plants, the soil that retains water supports plants (2021, Hamrawi), in addition to microclimate variation and its impact on meeting the requirements of the plant type in terms of temperature and sunlight and influencing the amount of evaporation (2007, Conner), as well as the administrative processes accompanying agriculture and what they negatively or positively affect in the density of plant species as well as grazing by animals (2011, Al-Bayati.(

A study of the biomass in the study area has shown that it is low, ranging between 842.9 and 3631.8 gm/m2, at a rate of 2012.9 gm/m2. The reason for this is due to the shift of the climate system to dry as a result of decreased rainfall and higher temperatures, and the negative effects on the natural plant life. The results of Figure (16) indicate that there is a clear difference in the biomass with varying physiographic location. the RL unit recorded the highest biomass, amounting to 3631.8 gm/ m2, followed by the D unit, at 2156.4 gm/ m2, while the lowest biomass recorded at the HB unit amounted to 842.9 gm/ m2, which decreased 76.8% compared to the RL unit. This indicates the importance of climate, especially microclimate, in the spatial distribution of plant species and their biomass (2021, Zhao.(

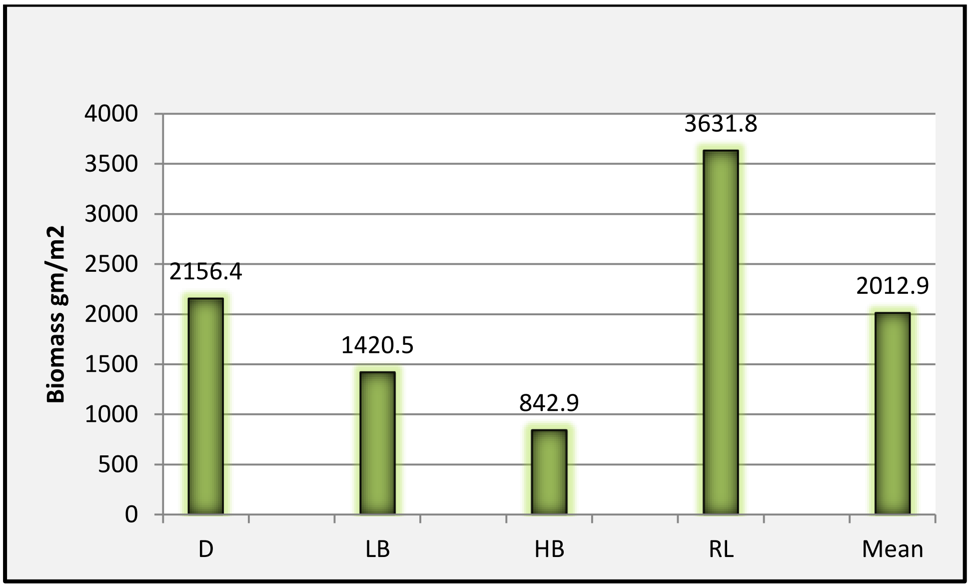

Figure 16. The biomass of vegetation within the diagnosed physiographic units in the region and its average for all study area.

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It has been observed from studying the natural flora of the study area, based on previous studies, that some previously identified plant species have disappeared, namely:

Anastatica hierochuntica L., Calligonum tetrapterum, Leontic leontopetalum, Scorzonera papposa DC, Scorzonera schweinfurthii Boiss, Gagea reticulate Schult, Scoraonera paposa DC. Iris sisyrinchium L., Carex stenophylla WAHLENB, Papaver hypridum, Erodium Spp., Erodium laciniatum(CAV) WILLD, Aegilops Crasssa Bioss Diagan Ser, Bromous tectorum Var., Schismus barbatus L., Horrdeum glaucum steud و Lolium rigidum Gaud و Lophochloa phleoides و Rostraria pumila و Phalaris minor, Schismus arabicus, Sisymbrium irio, Medicago aschersoniana, Melilotus Mill, Plantago lagopus L., Plantago boissieri, Plantago ciliate, Matricaria aurea(LOEFL), Poa bulbosa Steudhg, Anabsis setifera and Teucerium oliverianum Ging . Note that (1980, Townsend) and (2005, El-Tantawi) have indicated its presence in the study area, due to human interference in the environment of the study area through random plowing and logging, as well as the plant Calligonum tetrapterum, which is one of the small perennial shrubs that the inhabitants of the desert used as the best types of fuel. The current study did not record any presence of it in the study area and overgrazing, in addition to the low amount of rainfall due to harsh climate change, soil deterioration, and sand drift, which are all negative factors that had a prominent role in the decline of plant species and numbers within the study area.

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