

Biodiversity in the Northern Region using GIS and Remote Sensing

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ABSTRACT

Biodiversity, biological diversity, biological diversity, biological diversity, biological diversity, biological diversity, biological diversity (by developmental factors) environmental factors and environmental factors environmental factors and environmental factors and environmental factors Correlation between biology and the succession of geological and historical factors of living organisms and geological and historical factors to the site and what It is surrounded by natural and tourist attractions and the pursuit of scientific methods in order to advance the studies of biological diversity in the region.

Keywords: diversity, biology, biological.

INTRODUCTION

Biodiversity describes the diversity of life on Earth, including the 8 million species of plants and animals found on the planet, the ecosystems that harbor them, and the genetic diversity among them.

Biodiversity is a complex and interconnected network, in which each member plays an important role and contributes in ways that may not be visible to the eye. The abundant food we eat, the air we breathe, the water we drink, and the weather that makes our planet habitable all come from nature.

Biodiversity is the foundation that supports all life on land and under water. It affects every aspect of human health, providing clean air and water, nutritious food, scientific understanding and drug sources, natural disease resistance, and climate change mitigation. Changing or removing one element of this network affects the entire life system and can lead to negative consequences. Without nature, life on Earth would not be possible.

FIRST: THE RESEARCH PROBLEM

The current research seeks to investigate biodiversity in the northern region of Iraq using geographic information systems and remote sensing, and to know existing and extinct biological organisms, as well as to study the vegetation cover represented in the forests in northern Iraq.

SECOND: THE IMPORTANCE OF RESEARCH

The importance of research is what biodiversity constitutes from the components of the biological or ecological system for any geographical area of human dimensions, whose impact extends to include the relationships of stability of living organisms linked to each other in their environmental surroundings according to the gradation of their biological classification, from which people benefit in their agricultural, medical and industrial programs, and that any A decline in this relationship for natural or human reasons will be accompanied by an imbalance in the ecological balance, which portends multiple dangers to the different life systems. Hence, the importance of

studying biodiversity in an important and rich region such as the North shows us, in addition to the recent study of such topics.

THIRD: RESEARCH OBJECTIVES

The study aims to show the extent of the impact of natural and human factors on biodiversity in the study area, and to show the ability of GIS to enter, process and analyze metadata and the extent to which it is linked to quantitative data, and thus provide a database for uses, analysis and production of maps by GIS and remote sensing.

FOURTH: THE BOUNDARIES OF THE STUDY AREA

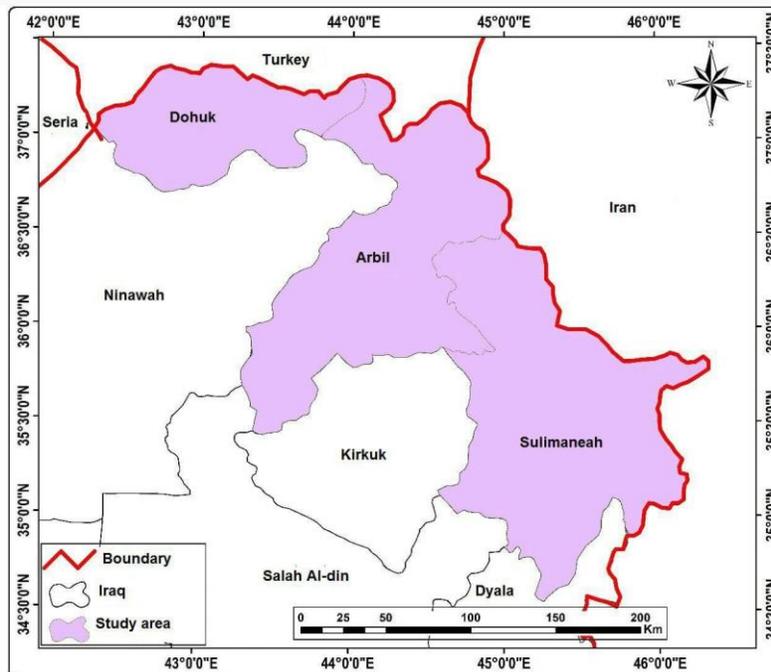
The northern region of Iraq includes three governorates represented by the governorates (Dohuk, Sulaymaniyah, and Erbil) with an area of (87,317)

km², or (20) percent of the total area of Iraq, bordered by Turkey to the north, to the south by Diyala, Kirkuk and Nineveh governorates, to the east by Iran and to the west by Syria. As for astronomically, the study area is located between longitudes ($48 = 23 - 41^\circ$) and ($26 = 22 - 46^\circ$) east, and between two latitudes ($19 = 06 - 33^\circ$) and ($41 = 14 - 37^\circ$) north, map (1).¹

FIFTH: THE CONCEPT OF BIOLOGICAL DIVERSITY

Definitions of biodiversity differed because it is a relatively recent term. The National Biosafety Committee in Syria defined biological diversity as (the diversity of living organisms from any terrestrial or aquatic environmental source, and includes diversity within each species and between species and ecosystems), as well as biodiversity defined. The difference and contrast between living organisms and the ecosystems of which they are a part.²

Map1 The geographical location of the study area



¹ The National Biosafety Structure in the Syrian Arab Republic, October 2006, Biosafety Rules, Appendix (10), pg. 50

² Center for Environmental Health Sciences, Birzeit University, Environmental Education Program February 12, 2009, p. 14

Researchers believe that biological diversity is the diversity of all living organisms and the interaction among them, starting with microorganisms that we can only see through a microscope, and ending with large trees and huge whales.

Biodiversity is ubiquitous in deserts, oceans, rivers, lakes and forests. The most comprehensive definition of biodiversity is that set by the United Nations, which is contained in the Convention on Biological Diversity, which means: heterogeneity among living organisms from all sources, which includes terrestrial, marine and other aquatic ecosystems, and diversity within species as well organisms.

Biodiversity, in short, is the diversity of all life forms on the face of the earth, whether on land, underground or in water. Biodiversity provides the world with a guarantee of access to continuous supplies of food and countless types of raw materials that humans use in their daily lives and to build their present and his future. Biodiversity does not only include species present in an aquatic environment or on land in a specific unit of time, but also includes the ecological and genetic systems from which these species came.

SIXTH: TYPES OF BIODIVERSITY

Biodiversity can be divided into three categories distributed hierarchically:

1- Diversity of ecosystems

It means the different ecosystems, so we find: forests, mountains, and rivers. Environmental diversity includes the number of species in certain areas and the environmental roles that these species play in terms of temperature differences and the accumulation of snow and rain, and the roles that these species play and the ecosystems in which these species exist, including processes that occur between and within these systems.

2- Variety of items

It means the difference of species within a certain environmental medium, such as the different types of animals, so we find birds, fish, and mammals. Biological.

3- Genetic diversity

It means the diversity of genes within the same species or species, which gives distinct groups of the same species, so we find in the same species several genera or sub-species.³

Biodiversity, which is accompanied by genetic diversity, is an enormous natural wealth, as it contributes to the production of food materials, medicinal drugs, medicines and raw materials used in industry, as well as an important agricultural and human food source, as well as agricultural and human nutrition.

SEVENTH: THE BENEFITS OF BIODIVERSITY

1- The presence of many organisms that analyze CFC, which damages the ozone layer, and these organisms also eliminate harmful pests.

2- It has economic value and medical benefit by exploiting the genetic complex present in these organisms to improve plants and animals, as it allows the production of varieties with good qualities such as many crops and the production of medicines from these organisms.

3- It has an environmental value The presence of these organisms on the surface of the globe maintains the existence of balanced and stable ecological systems in which the processes of recycling, production and analysis of materials occur.

4- The presence of plants is a source of oxygen through the process of photosynthesis.

³ Center for Environmental Health Sciences, Birzeit University, Environmental Education Program February 12, 2009, p. 14

Available at: <http://home.birzeit.edu/bzutl/environmentalelocation.doc>

When there is any decline in the multiplicity of vital species due to human practices and climate change, this will lead to the deterioration of natural habitats, as well as the entry of invasive species, which are non-local species that reach human influence, in addition to the presence of other reasons that lead to the extinction of these living organisms such as overfishing and the high level of pollutants.

EIGHTH: BIODIVERSITY IN THE NORTHERN REGION

Since Iraq is located within two ranges of global migration lines for birds, birds migrate from Siberia and Southeast Asia through Mongolia, China, Afghanistan and Iran, to stop the winter period in the center of the country. Below are the most important forms of biodiversity in the northern region and Iraq, which the researchers decided to divide according to the following: -

1- The biodiversity of wild animals

Temperature is an important factor to control the distribution of animal groups and usually its effect is coupled with the effect of humidity, and the change in temperature is an important factor that controls temperature rates inside the body of an organism, so it naturally controls its activity rate.

The rise in body temperature increases the interactions important for the vital processes within the body of the organism and its slow decline in the speed of those interactions. Iraq possesses types of wild mammals such as

The Indian gray weasel in Iraqi Kurdistan and the decline in animal numbers and the occurrence of extinctions in specific places can be directly attributed to climate change, as climatic changes can upset the delicate balance in the life network that links species in individual ecosystems.

Wild animals in the study area can be grouped into the following types:

- The wild donkey was abundantly present in the Al-Jazirah region between the Tigris and Euphrates rivers at the beginning of the twentieth century, but its numbers began to decrease as a result of the high temperature in this region, which prompted it to move to the northern regions of Iraq, and its last sighting was near Sinjar during the year 1947. picture (1).
- Al-Reem gazelle is found in the border areas between Iran and Iraq and its numbers have decreased recently as a result of overfishing, and there are small numbers of them in the Makhmour area between Kirkuk and Erbil, in addition to the Daquq area near Kirkuk, photo (2).⁴

Picture (1) The extinct wild ass from the region



Source: Osama Al-Nahhat, Extinct Animals from Iraq, Website: www.nhm.uobaghdad



Source: <https://www.dorarliraq.net/threads/1>

⁴ Iraqi Museum Research Center, research on biodiversity published on the website <https://www.google.iq>.

- Mountain goats and white mountain goats in high mountainous areas and in rare numbers, photo (3).
- The wild sheep also exists: it is found in limited numbers in the northern mountainous region and the border areas with Iran, from Khanaqin to the south of Al-Amarah.

Picture (3) Mountain goats in northern Iraq (Barzan region north of Erbil)



Source: <https://www.basnews.com/ar/babat/601003>

- There is one type of bear in the northern and northeastern region, which is the Grizzly Bear, and in very small numbers, it is considered one of the rare animals.
- There is also a squirrel where there are walnut and almond trees, and a squirrel was found in the very recent period by a young man, on 3/28/2021, photo (4).

Picture (4) Squirrel in northern Iraq



Source: <https://www.google.com/url>

- The porcupine is one of the few animals that is found in Hamrin and eastern Iraq.
- Many animals disappeared and became extinct in the numbers of animals such as the salamander of

- The year (1930) recorded large numbers of the Syrian bear and its presence continued in the mountainous region until a recent period, but it began to decrease and become extinct during the last decade (2000-2009) as a result of high temperatures and lack of precipitation.

Kurdistan, which is found in the mountains surrounding the Turkish-Iranian-Iraqi borders.

- This type of colored amphibian has been recorded in Iran, but it has not been recorded in Iraq since the year (1991), as it had a presence in separate places in northern Iraq in the 1960s and its numbers started decreasing during the seventies, when its numbers decreased in the eighties.
- There is also a type of turtle in the Kurdistan region, which is known as the Kurdish wood turtle, which was spotted in Jabal Safin in 2018.

Source: Republic of Iraq, Ministry of Evidence, Outlook for Environment Conditions in Iraq, 2014, pp. 87-99. Nature Iraq has carried out an extensive study of birds in Iraq and has identified information related to the state of extinction, reproduction and the state of concern.

Among the most important types of birds spread in the northern region are:-

- Jackdaw and Starling

These birds are also winter visitors to Iraq in large numbers, and some of the starlings breed in the northern regions.

- Houbara Bustards

It is found in most regions of Iraq, especially in the desert regions, and a small part of it spawns in the central regions of Iraq, and there is another species (Haram) Great Bastard that is found in small numbers in the central and northern regions.

- Egyptian Vulture is very common in Iraq and spawns in some northern regions.

- bearded eagle
- Bearded Vulture: It is found in the northern region, but in limited numbers.
- Golden Eagle: a winter visitor found in the northern regions
- Buzzard: a winter visitor and is found in most of the Iraqi lands, and some of them breed in the mountainous region.
- Mouse Hawk Kestrel: Very common in all regions and spawns in the northern regions of Iraq.
- Red Kite: It is found in the northern region and in limited numbers.
- The Black Kitten: a winter visitor and may breed in the northern regions.

The assessment of birds found that the species and number of birds are declining as a result of climate change is three times more than those that are increasing in number, and the specific impacts of climate change on biodiversity will depend to a large extent on the ability of species to migrate and withstand more severe climatic conditions. The ecosystems have adapted to the relatively stable climatic conditions, and when these conditions are disturbed, the only options for the species are to either adapt, move or perish. widely and in scattered places in northern Iraq,

Most of the birds in the world's regions migrate and then return to their homelands. They leave their homelands in certain climatic conditions and then return with the demise of those conditions, and this happens periodically, but what happens in Iraq is completely different. The climatic conditions of high temperatures, lack of rain and drought in its areas make some of its types. It is on the red list.

As for the fish found in the area, they are carp, bale fish, royal sorrel fish and common carp fish, Qattan.

Some species of fish have suffered from extinction due to fishing operations.

2- The biodiversity of wild plants

There are 182 species of plants in Iraq, of which 62 are permanent in most environmental areas, 64 are seasonal, and 56 are threatened with extinction, and that there are (67) sites in Iraq that are considered important places for the growth of wild plants. These are key sites despite the decline in vegetation cover in them, while there were (17) sites (23%) threatened with extinction, of which (3) sites are in the mountainous region.

While the number of types of natural plants in the mountainous region reached (68) species and that was during the year 1973 to diminish until its numbers became (50) species during the seventh decade of this study⁵, as the plants of this region suffer from high temperatures in the summer This has led to the obstruction of plants to the point of non-existence, and that 40.7% of these plants are threatened with extinction due to rising temperatures.

The change in climatic conditions has led to the deterioration of the deciduous forests dominated by oak trees, pistachio and almond forests, which are typically located in northern Iraq, although the region is considered critical due to the high temperatures during the last decade of this century, the lack of precipitation and the increase in evaporation, as the Iraqi forest lands are mainly located In northern Iraq, Table (2) changes in the vegetation cover in Iraq for the period between 1990-2009. It is noted from Figure (1) that the rate of change in the area of forests did not change in significant proportions, and this was shown by the rate of change that amounted to (0.17) for the period between (1990 - 2000), while the annual rate of change for the period (2000-2009) was (0.10), while the annual change rate was (0.27) during the period (1990-2009).⁶

⁵ *Forecasts of environmental conditions in Iraq, a previous source, p. 101.*

⁶ *The fourth national report to the Convention on Biological Diversity, competition source, p. 20.*

Table (2) Total forest cover (hectares) in the northern region

Duration Area Annual percentage change

1990 804,000 hectares -

2000 818000 hectares -

2009 822,000 hectares -

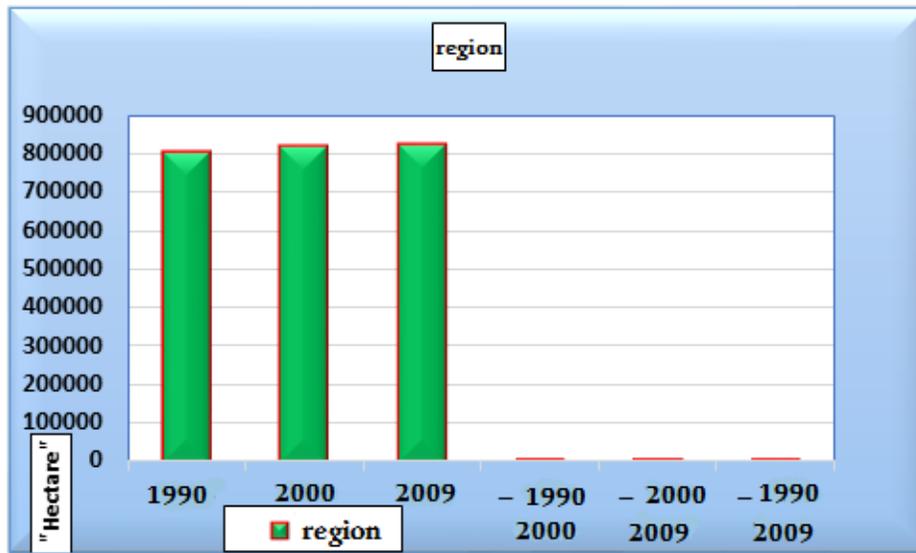
1990 - 2000 1400 hectares (%) 0.17%

2000 - 2009 800 hectares (%) 0.10%

1990 - 2009 1880 hectares (%) 0.27%

Source: Republic of Iraq, Ministry of Environment and the fourth national report to the Convention on Biological Diversity, p. 25.

Shape (1): Annual distribution of total forest cover (hectares) in the northern region



Source: Researchers based on Table (2).

In the plains to the north of Mount Sinjar, pyramidal trees of olives and pistachios are scattered in wheat and barley fields. These trees are not located on a watercourse, and they are very scattered and are likely to be natural trees and represent the rest of the vast forest.

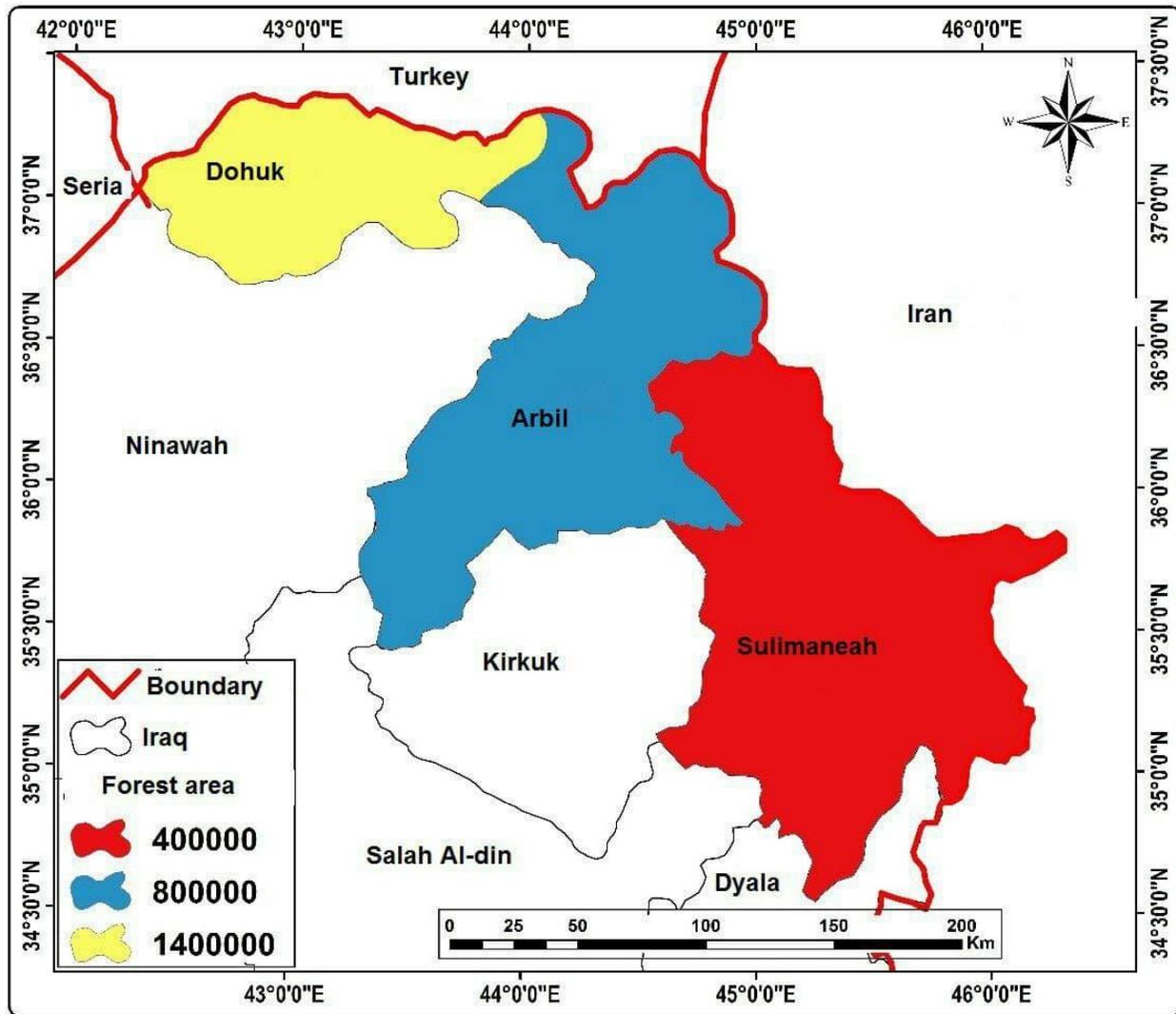
At the level of forests, it is noted from Table (3) and Map (2) that the area of forests varies between one governorate and another within the study area. The highest forest area was recorded in Dohuk governorate, which amounted to (1,400,000) dunams, at a rate of 53.8%, then Erbil governorate with an area of It reached (800,000) dunams, at a rate of (30.8), and the Sulaymaniyah Governorate ranked last, as the area of forests reached (400,000) dunams, or 15.4%.

Table (3): The area of natural forests in northern Iraq

Governorate	Area (Dunams)	Percentage (%)
Dohuk	1,400,000	53.8
Erbil	800,000	30.8
Sulaymaniyah	400,000	15.4
Total	2,600,000	100%

Source: Salah Hamid Al-Janabi, Saadi Ali Ghalib, Regional Geography of Iraq, 2nd Edition, Dar Ibn Al-Atheer for Printing and Publishing, Mosul, 2005, pg. 159.

Map (2) Forest area in northern Iraq



Source: Researchers based on Table (3) and Arc GIS 10.5 software.

CONCLUSIONS AND RECOMMENDATIONS

FIRST: THE CONCLUSIONS

- 1- More than (8) species of birds recorded the extinction of birds due to climatic changes, especially during the last decade of this study.
- 2- The extinction of many wild animals, the most important of which are the golden eagle, the reem, the bear, the dolphin and the squirrel, as they do not have the ability to withstand the climatic conditions and because of overfishing.

3- A relative change was noted in the cultivated areas of forests in the northern region, with this change reaching a maximum during the period from (1990) to (2005) with (2.24%) and (25.54%) for the area of tree lands in the forests and 13.13% for the cultivated lands in Forests.

SECOND: RECOMMENDATIONS

Based on the previous results, the researchers were able to include the following recommendations:

1. Enhancing technical and technical capabilities and developing geographic information systems and modern methods of monitoring to protect biological diversity.
2. Emphasis on consolidating the relationship of human spatial behavior with the surrounding vital systems and raising the cultural awareness of citizens for the purpose of preserving biological diversity.
3. The integration and protection of biodiversity must be based on creating a balance between the needs and requirements of society and individuals and the ecological balance without any disruption to any of these elements.
4. There are ways and methods through which to protect biodiversity and develop natural reserves, including the issuance of legislation and laws that regulate everything related to biological diversity and preserve it from deterioration, such as environmental approvals for the activity of random grazing operations, overfishing and deforestation.

SOURCES

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