



# Journal of Geology, Geography and Geoecology

Journal home page: [geology-dnu.dp.ua](http://geology-dnu.dp.ua)

ISSN 2617-2909 (print)  
ISSN 2617-2119 (online)

Journ. Geol. Geograph.  
Geology,  
31(2), 273–279.

[doi:10.15421/112225](https://doi.org/10.15421/112225)

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Journ. Geol. Geograph. Geoecology, 31(2), 273–279

## Landscape of Altiaghaj National Park

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Received 01.05.2022

Received in revised form 12.05.2022

Accepted 12.06.2022

**Abstract.** Altiaghaj National Park was established by the Order No. 365 of the President of the Republic of Azerbaijan on August 31, 2004 in the administrative territories of Khizi and Siyazan districts. The National Park is located in the north-east of Azerbaijan, in the territory of Khizi and Siyazan administrative districts. Altiaghaj National Park was created on the

basis of Altiaghaj State Nature Reserve, which was established in 1990, and adjacent state forest fund lands. Its area is 11,035 hectares. The article examines the landscapes of Altiaghaj National Park. During the study 4 landscape complexes and 33 types of landscapes were identified in the territory of Altiaghaj National Park. Within the first complex, 8 types of landscape were identified; in the second landscape complex – 8; in the third complex-10 and in the last landscape complex-7. These landscape complexes are divided according to the degree of division of the area, geological and geomorphological features, as well as different soil and vegetation. The article also describes changes in landscape types due to natural and anthropogenic influences. A special interpretation is given to changes in the forest landscape complex caused by anthropogenic influences. During the study, vertical differentiation of the landscape was observed in the territory of Altiaghaj National Park. This is due to the fact that the territory of Altiaghaj NP is mainly mountainous. Due to the decrease in temperature with increasing altitude (the temperature decreases by 0.60 per 100 m), the vertical zoning of the landscape is clearly visible here. Along with natural processes, anthropogenic impacts on landscape changes in the National Park have been observed here. During the study, we examined the status of the National Park, the existence of anthropogenic impacts that hinder its normal operation and ways to prevent them. Thus, during the establishment of the National Park, especially when defining its borders, the instructions were violated, the geographical location and economic situation of villages and settlements were not taken into account. Part of the highway fell into the territory of the National Park. All this has led to an increase in environmental tensions in the National Park. Violation of forest ecosystems and illegal felling of trees in Altiaghaj National Park are the most urgent and important issues of the day.

**Keywords:** national park, relief and geological structure, landscape complex, soil and vegetation, bushes, steppe and forest complex.

## Ландшафт Алтиагаджського національного парку

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**Анотація.** Алтиагаджський національний парк створений розпорядженням президента Азербайджанської Республіки № 365 від 31 серпня 2004 року на адміністративних територіях Хизинського і Сіязанського районів. Цей Національний парк розташований на північному сході Азербайджану, на території адміністративних районів Хизи і Сіязань. Алтиагаджський національний парк був створений на базі Алтиагаджського державного природного заповідника і прилеглих земель державного лісового фонду. Його площа становить 11 035 гектарів. У статті розглядаються ландшафти Алтиагаджського національного парку. В ході дослідження на території Алтиагаджського національного парку було виявлено 4 ландшафтних комплекси і 33 типи ландшафтів. В рамках першого комплексу було виявлено 8 типів ландшафту; в другому ландшафтному комплексі – 8; в третьому комплексі – 10 і в останньому ландшафтному комплексі – 7. Ці ландшафтні комплекси розділені в залежності від ступеня поділу території, геологічних і геоморфологічних особливостей, а також різних ґрунтів і рослинності. У статті також описуються зміни типів ландшафтів в результаті природних і антропогенних впливів. Особлива інтерпретація дана змінам в лісовому ландшафтному комплексі під впливом антропогенних впливів. В ході дослідження на території Алтиагаджського національного парку спостерігалася вертикальна диференціація ландшафту. Це пов'язано з тим, що територія Алтиагаджського національного парку в основному гориста. Через зниження температури в міру її підвищення (температура знижується на 0,60 на 100 м) тут чітко видно вертикальне зонування ландшафту. Поряд з природними процесами спостерігалася антропогенний вплив на ландшафтні зміни в Алтиагаджського національного парку. В ході дослідження ми вивчили стан цього національного парку, наявність антропогенних впливів, що перешкоджають його нормальному функціонуванню, і способи їх запобігання. Таким чином, при створенні Алтиагаджського національного парку, особливо при визначенні його кордонів, були порушені інструкції, не були враховані географічне положення та економічне становище населених пунктів. Частина шосе потрапила на територію цього національного парку. Все це призвело до зростання екологічної напруженості в ньому. Порушення лісових екосистем і незаконна вирубка дерев в Алтиагаджському національному парку є найактуальнішою і важливою проблемою сьогодення.

*Ключові слова: національний парк, рельєф і геологічна будова, ландшафтний комплекс, ґрунт і рослинність, чагарники, степово-лісовий комплекс.*

## Introduction

Altiaghaj National Park was established by the Order of the President of the Republic of Azerbaijan dated August 31, 2004 in the administrative territories of Khizi and Siyazan districts. Before that, by Azerbaijani government's decision dated to March 2, 1990, Altiaghaj State Nature Reserve was created on the basis of the state forest fund. Altiaghaj State Nature Reserve was founded in the territory of Khizi district with an area of 4438 ha. Later, Altiaghaj National Park was created on the basis of Altiaghaj State Nature Reserve and its adjacent territories and covers an area of 11035 hectares.

The main purpose of creating the National Park is to preserve, restore and prevent the erosion of forest cover of the south-eastern slopes of the Greater Caucasus and the natural landscape complexes, as well as to protect the plant and animal species, in brief, to protect the existing biocenosis.

During the compilation of the landscape map, mainly N. Sh. Shirinov, M. A. Suleymanov (1964), M. A. Museyibov, M. A. Suleymanov (1966), Kh. I. Omarova (1966), M. A. Museyibov (1981), M. M. Alirzayev (1981), M. A. Museyibov and others (1975), A. A. Mikayilov (1983), S. A. Alibeyov (1985) and others works written by the authors on the studied area were used.

G. A. Salamov (1961) shows that the hardened black soils in the Altiaghaj reserve were formed as a result of the change of brown forest soils under the forest. In the areas where the mountain joins the plateau, in the past, in the place of felled oak, elm and iron-black forests, individual trees appear. The rest of the area outside the reserve is completely plowed and covered with cultivated plants (wheat, corn, grapes, etc.), so forest plants cannot grow here.

The **aim** of the article is to examine all the issues listed separately.

## Material and methods

The information base of the study consists of journals published by the Ministry of Ecology and Natural Resources of the Republic of Azerbaijan and stock materials of the Institute of Geography of the Azerbaijan National Academy of Sciences, the current legislation of the Republic of Azerbaijan, scientific works of scientists who conducted research in this area, guidelines, as well as the results of scientific research conducted by the authors. When performing research work, the traditional geographical approach was used, from the method of identifying all components of the landscape with visual images by determining routes on the ground, field methods of observation and other methods were used.



**Fig.1.** Forest landscape in Altiaghaj National Park

## Results and Discussion

The scenery of the slopes played an important role in the landscape formation of the relief. The diversity created by these factors is more evident in the low and middle plateaus.

In order to create a more accurate image about the landscape types and semi-types, we believe it makes

sense to provide the images of a number of specific complexes.

During the study, we have identified 4 landscape complexes (types) in the territory of Altiaghaj National Park. They are dry-steppes and bushes on low hills, the forest complex of low uplands, forest complexes of middle uplands and also the beech and oak forests of



middle and relatively high uplands. Taking geological, geomorphological, relief, soil, and vegetation diversity into account, a number of landscape types have been identified within the complexes.

### ***I. The dry-steppe and bushes complex of the low hills***

This type of landscape is widespread on intermountain plains, plateaus, foothills, and mountain slopes. The diverse conditions of steppe complex in the area allow separation of 3 semi-types: humid steppes of low-hills, dry steppes of low-hills, and xerophytic shrubs of low-hills.

**a) Humid steppes of the low-hills** White grass, various grassy humid steppes with grain spread on blackish and post-forest dark chestnut soils and fragmented plateaus.

This complex covers the synclinal plateau in eastern shore of Bulanlig River, between Altiaghaj locality and Verdagh village and the relatively low eastern slope of the Dubrar mountain range. Principally, this zone is prevalent in areas of 400–450 m height. This complex also occupies a wide area on the monoclinical division of Yeddibulag, which rises to 750–810 m height on the right bank of Bulanlig River.

#### **b) Dry steppes of xerophytic shrubs of low-hills**

The landscape semi-type mainly covers the southern slopes of Khalaj mountain chain in the studied area. On fragmented slopes, fully brown mountain soils under dry steppes are covered with *Paliurus*, pomegranate bushes, and sparse wheat crops.

This type of landscape covers the Khalaj range, the southern slopes and partly the mountain slopes. This complex has taken shape on continental gravel, clays, and pudding rocks of the fourth period. The slopes are mostly covered with formations consisting of a mixture of sparse xerophytic shrubs and dry steppe plants.

Taking account the plant-soil diversity and other features, we have determined 8 types of landscape (1–8) within this landscape complex.

1. White grass, wormwood- white grass on chestnut and dark chestnut mountain soils of poorly fragmented plateau and low-hills;

2. Steppe plants on dark chestnut and brown mountain post forest soils on mountainous-hills, ridges, and plateaus;

3. Bushes in dark chestnut and brown mountain post forest soils on fragmented low hills and plateaus (with dominant oak trees, *Paliurus*, and *Rhamnus pallasii*);

4. Oak, oak-hornbeam forests, and bushes along with steppe plants in brown-forest and dark brown mountain post forest soils after the forest, on low hills and plateaus;

5. *Paliurus* and herbs in grey-brown and brown soils of steep slopes of fragmented low hills;

6. Grass, wormwood in dark chestnut soils of low mountains and fragmented plateau;

7. White grass, wormwood white grass on brown and dark brown mountain soils of plateaus and pits of poorly fragmented low hills;

8. White grass on brown and black soils of poorly fragmented plateau after the forest.

### ***II. Forest complex of low-hills***

Growth of broad-leaved forests primarily depends on geomorphology, orographic structure, and climatic conditions of the territory. There are oak and oriental hornbeam (demirgara) forests on poorly fragmented brown mountain-forest and brown hillsides. This type of landscape covers some parts of the National Park which ranges to 600 m height, the areas between the Ata River and Guneygishlag village, at the same time, on the areas of that height, as well as the north-west of small plateau.



**Fig. 2.** Altiaghaj National Park high mountain meadows

Primarily, the lower (4–5 m) oak and oak – demirgara trees-dominated forests are prevalent in these areas. Basic species of trees growing here are Georgian oak, demirgara (oriental hornbeam), birch, Cotinus, pears and others. Down the slopes, the forest is gradually replaced with hips, Paliurus, and blackberry bushes. The grass cover is dense enough and includes alfalfa, ribbon grass Equisetum, and so on.

Under the forest and grass cover, mostly mountain brown soil is formed (with humus content of 3–5 %). Since the lower parts of the slopes are near residential areas, trees have been intensely cut and replaced with dense bushes.

We have identified 8 types of landscape inside this landscape complex (9–16). 9. Hornbeam, oak, and partly the beech trees are dominant in brown-mountain forest soils of averagely fragmented western slopes; 10. Hornbeam, cornel, and oak trees in brown mountain-forest soils of averagely fragmented south-eastern slopes; 11. Hornbeam and oak trees on brown mountain-forest soils of intensely fragmented southern slopes. 12. Hornbeam, poplar, birch, and oak trees on alluvial forest soils of poorly fragmented terrains; 13. Paliurus, hawthorn, and oak trees on brown mountain-forest soils of averagely fragmented south and south-eastern slopes; 14. Oak, hornbeam, and poplar trees on brown mountain-forest soils of intensely fragmented southern slopes; 15. Hornbeam and oak trees on rocky ground on intensely fragmented eastern slopes; 16. Oak and birch trees on eroded brown mountain and forest soils of intensely fragmented southern slopes. 17. Alfalfa, and sparse hornbeam in poorly fragmented flat pits, on black mountain post forest soils; 18. Sparse

hornbeam and beech trees on averagely fragmented western slopes, in brown mountain forest lands; 19. Poplar, elm, and hornbeam on poorly fragmented terrains, on alluvial forest soils; 20. Hornbeam and beech trees on intensely fragmented western slopes, in brown mountain-forest soils; 21. hornbeam, birch, and beech trees on averagely fragmented south-western slope, on brown forest soils; 22. Hornbeam, oak, and beech trees on averagely fragmented western slopes, on brown mountain-forest soils; 23. Hornbeam and poplar trees on alluvial forest lands of poorly fragmented slopes; 24. Hornbeam and beech trees on brown forest soils of intensely fragmented north-western slopes; 25. Hornbeam and birch trees on brown forest soils of averagely fragmented northern slopes; 26. Hornbeam and beech trees on brown forest soils of averagely fragmented north-western slopes.

### **III. Forest complex of the mid-mountain chain**

Oak and beech forests of the mid-mountain chain grow in the territory of 1100–1200 m height. In higher areas, oak forests are substituted with forests composed of the mixture of beech and beech-hornbeam trees. Beech and beech-hornbeam forests of the mid-mountain chain in studied area have formed in extremely humid conditions, at approximately 1000–1800 m of altitude, in differently podzolic brown mountain-forest and dark brown and brownish mountain-forest soils. These forests occupy large areas in Altiaghaj NP. Considering the geological structure and diversity of geomorphological soil and vegetation, we have determined the following types of landscape.



**Fig. 3.** Wildlife in Altiaghaj National Park

### **IV. Beech and oak forests of the middle and moderately higher mountains**

Altiaghaj National Park which basically covers the middle belt and moderately higher mountain area

includes the territories with a height of 1000–1600 meters above sea level. In this zone, along with oak and oak- beech forests, the hornbeam forests are widespread as well. Beech-dominated forests are mostly located



1400–1600 m. above sea level. In the Altiaghaj National Park area, the northern slopes are covered with pure

beech forest, the eastern and western slopes are under beech and hornbeam and oak-hornbeam forest.



**Fig.4.** Forest landscape complex in Altiaghaj National Park and river erosion in Atachay

Some researchers (Prilipko, 1954; Budagov, 1961; Karamov, 1966) have recognized the upper border of the forest zone at a height of 2300 meters. The border itself often changes due to human and climatic factors. Low and middle upland terrain is composed of intensely and moderately fragmented cones and surfaces. The area is composed of sandstone, limestone and clay shale of the Jurassic period. Annual precipitation ranges between 750–1300 mm. Forests occupy a large area, but it does not cover the entire full natural habitat everywhere. There are inter-forest areas under montane scrub. Subalpine forests of the northern slopes often alternate with bushes above to high grassy forest.

Depending on the slopes, the forests of the Greater Caucasus are divided into several forest formations: beech forests are bordered by sub-alpine meadows in the Gonagkend mountain area. On inaccessible and steep slopes, the forests are sparse. The forest area in the eastern part of Velvelechay serves as a good example of that. Here, the beech forests include hornbeam, birch, oak, and other trees (Prilipko, 1954). Taking the diversity of the soil and vegetation within this landscape complex into account, we have classified the following types of landscape (27–33): 27. The beech forest on brown mountain-forest soils of intensely fragmented western slopes; 28 Beech and scattered hornbeam trees on brown forest soils of intensely fragmented western slopes; 29. Beech and oak trees on brown forest soils of intensely fragmented south-east slopes; 30. Beech and scattered hornbeam trees on brown forest soils of intensely fragmented eastern slopes; 32. Beech and oak trees on brown and dark brown forest soils of averagely fragmented western slopes; 33. Beech and scattered oak trees in brown forest soils of intensely fragmented north-western slopes.

### ***I. The complex of dry-steppe and bushes of low-hills***

1. White grass, wormwood- white-grass, on chestnut and dark chestnut mountain soils of plateau and lowlands of poorly fragmented low-hills,

2. Steppe on dark chestnut and post-forest brown mountain soils of ridges and plateaus and mountains and hills,

3. Bushes on dark brown and post-forest grey-brown mountain soils of fragmented low-hill and the plateau (oak-dominated forests with *Paliurus* and *Rhamnus pallasii*),

4. The oak, oak-hornbeam forests, and shrubs within the steppe vegetation on brown forest and brown-mountain soils of low hills and plateaus,

5. The *Paliurus* and brushwood on grey-brown and chestnut soils of fragmented steep slopes of low mountains,

6. Grass, wormwood, and agrotis in dark chestnut mountain soils of low -hills and fragmented plateaus

7. White grass, wormwood- white grass on chestnut and dark chestnut soils of poorly fragmented low-hills,

8. White grass on brown and blackish soils of poorly fragmented plateaus.

### ***II. Forest complex of low-hills***

1. Hornbeam, oak, interspersed with beech trees on brownish mountain-forest soils of averagely fragmented western slopes,

2. Hornbeam, cornel, and oak trees on brownish mountain-forest soils of averagely fragmented southern and north-eastern slopes

3. Hornbeam and oak trees on brownish mountain-forest soils of intensely fragmented southern slopes.

4. Poplar, birch, willow, and oak trees on poorly fragmented alluvial forest terraces.

5. Paliurus, hawthorn, and oak on brownish-mountain-forest soils of averagely fragmented south-eastern slopes,

6. Oak, poplar, and birch trees on brownish mountain-forest soils of intensely fragmented southern slopes

7. Hornbeam and oak on the rocks of intensely fragmented eastern slopes

8. Oak and birch trees on eroded brownish mountain-forest soils of intensely fragmented southern slopes.

### **III. Forest complex of mid mountains**

1. Alfalfa, ribbon grass herbs, and sparse hornbeam on poorly fragmented mountain black post forest soils

2. Sparse hornbeam and beech forests on averagely fragmented western slopes of brownish-mountain soil,

3. Poplar, elm, hornbeam forests on alluvial forest soils of weakly fragmented terraces,

4. Hornbeam and beech forest on brownish-mountain-forest soil of intensely fragmented western slopes

5. Hornbeam, birch and beech forests on brownish-mountain-forest soil of averagely fragmented south-western slopes.

6. Hornbeam, oak, beech forests on averagely fragmented brown mountain-forest soil of the western slopes,

7. Hornbeam and willow forests on alluvial forest soils of poorly fragmented meadow soils

8. Hornbeam and beech forests on brown forest soils of intensely fragmented north-west slopes

9. Hornbeam and birch forests on brown forest soils of averagely fragmented northern slopes

10. Hornbeam and beech forests on brown forest soils of averagely fragmented northwest slopes.

### **IV. Beech and oak forests of medium and moderately high mountains**

1. Beech on brownish-mountain-forest soils on intensely fragmented western slopes.

2. Beech and sparse hornbeam on brownish-forest soils on intensely fragmented

3. north-eastern slopes.

4. Beech and oak on brownish-forest soils on intensely fragmented southeastern.

5. Beech and sparse hornbeam on brownish-forest soils on intensely fragmented eastern and northern slopes.

6. Beech and sparse hornbeam on brownish-forest soils on averagely fragmented, unstable, landslide prone south-eastern slopes.

7. Beech and oak on brownish-forest soils on averagely fragmented western slopes.

Beech and sparse oak on brownish-forest soils on intensely fragmented north-western slopes.

In the middle mountainous area, precipitation is unevenly distributed in the area we studied. While 1000–1300 mm of precipitation falls in the Atachay basin at an altitude of 1800 m, 600–700 mm of precipitation falls in the Bulanligchay and Tikh river basins. Therefore, the forests in the western part of the area are denser, more colourful and productive in terms of species composition. In the eastern parts, especially in the middle mountains of the Atachay basin, sparse hornbeam, hornbeam-beech forests have developed. Here, in the middle mountain forests, up to 90 % of all tree species are hornbeam or beech, and 10 % are oak, ash, maple, etc.

As a result of human activities, these forests have been intensively deforested. In the west and east of the area, the forests differ from each other depending on the humidification regime and relief features. The average height of the trees is 3–5 m, and 6–8 m in the lower parts.

Natural restoration is observed in the felled areas of forests. Wild peas, mules, forest shorts, cattails, etc. usually grow well in such places. Unlike low mountain forests, there are few forest branches here. Forest shrubs (maple, cornel, hawthorn, cypress) grow only in the lower reaches of these forests. In the upper areas, they are almost non-existent.

The forests near the villages of Khalaj, Khizi, Bakhishli are mostly cut down. The semi-depression was once completely covered with forests. As a result of intensive human activities, these forests have been significantly reduced in area.

Limestone, marls, sandstones, Middle Jurassic sands are widespread in the areas where this landscape complex is spread.

During the study, we examined the status of the National Park, the existence of anthropogenic impacts that hinder its normal operation and ways to prevent them. Thus, during the establishment of the National Park, especially when defining its borders, the instructions were violated, the geographical location and economic situation of villages and settlements were not taken into account. Part of the highway fell within the territory of the National Park.

In addition to grazing cattle in the National Park, illegal felling of trees and shrubs, illegal planting of grassland and protected areas, other anthropogenic impacts have worsened the ecological situation of Altiaghaj National Park, resulting in the degraded forest becoming unusable. Recently, illegal use of land under the motto of land privatization, seizures, misappropriation of lands in the state fund has also been observed in Altiaghaj National Park, which violated the protection regime.

Taking all this into account, it is expedient to implement the following reclamation measures in

order to improve the ecological situation of Altiaghaj National Park.

1. Anthropogenic impacts can be partially prevented by creating a buffer zone 1 km wide at the edge of the National Park at the expense of the territory of Altiaghaj State Reserve.

2. This measure should be extended to 1.5 km near the villages of Gizil Gazma, Yarimja, Altiagaj, Bakhilli, Yeni Khalaj and Kars.

3. Fencing should be erected at the edge of the National Park to isolate the entire area from the surrounding areas. As in all reserves, anthropogenic impacts are intensifying in this reserve, as there is no fencing.

### Conclusion

During the landscape mapping of «Altiaghaj National Park», it was found that the relief and geological structure of the mountainous area both in altitude and in the surrounding area are different. This

change creates a hierarchy of mountain landscapes, which is the basic law of physical and geographical differentiation in the mountains. The main tiers are defined for mountainous as low, medium, high and the highest areas. There is a connection between such hierarchies of mountains and vertical landscapes. The lower floor usually corresponds to the initial zone close to the plains. The view of the expositions in connection with the relief forms also played an important role in the formation of the landscape. The diversity created by the influence of these factors is more pronounced in the middle and high mountains. Along with natural processes, here we have also observed anthropogenic impacts on the landscape changes in the territory of National Park. All this has led to an increase in environmental tensions in the National Park. Violation of forest ecosystems and illegal felling of trees in Altiaghaj National Park is the most urgent and important issue of the day.

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