



# LECTURE 10



The main elements of plant ecology . The main environmental factors affecting the development of plants. Plant introduction. The concept of life form. Systems of life forms of plants. Elements of phytocenology. Plant communities, their formation.

Plant zones and the main types of vegetation of the Earth. Vegetation of Azerbaijan.





# The main elements of the plant ecology

**Ecology**(from Greek. οἶκος — home, housing) a system involving the interactions between a community of living organisms in a particular area and its nonliving environment.

**Plant ecology is a science that studies the relationship of plants with their environment and with each other. The subject of the study of ecology, therefore, are plants, or their groups, changing under the influence of various environmental factors. Objects of research in plant ecology are either individual plants (autecology) or populations (demecology).**

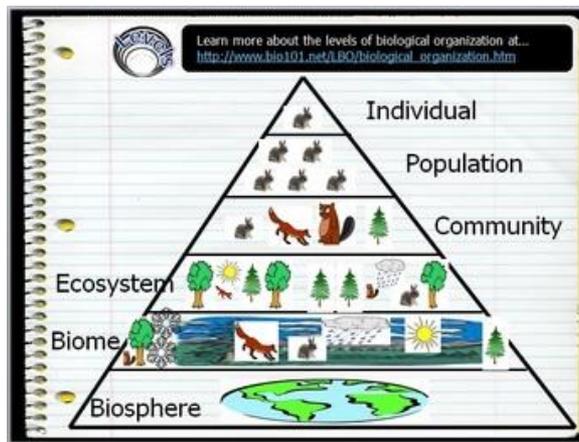
**To environmental factors affecting on plants are:**

- Climatic factor;**
- Soil or edaphic factor;**
- Biotic factor;**
- Anthropogenic factor;**
- Orthographic or relief factor;**
- The historical factor.**



# THE IMPORTANT CONCEPTS AND OBJECTS OF PLANT ECOLOGY

- **Biosphere**-terrestrial environment of the spread of life, covering the lower part of the atmosphere, the hydrosphere and the upper part of the lithosphere. Normal existence of a plant outside the biosphere is impossible
- **Ecosystem**, or **ecological system** (from the ancient Greek οἶκος - housing, residence and σύστημα - system) - biological system (biogeocenosis), consisting of a community of living organisms (biocenosis), their habitat (biotope), a system of exchanges substance and energy between them.
- **Habitat (biotope)** is a set of specific abiotic and biotic conditions in which a given individual, population or species, part of nature, surrounds living organisms and has a direct or indirect effect on them.
- **Population** (from Lat. populatio - population) is a collection of organisms of one species that have been living for a long time in one territory (occupying a certain range) and partially or completely isolated from individuals of other similar groups.





# Climatic factor



Climatic factors include: water, light, temperature and air.

**Water** is an important substance for a plant, a substance that participates in all physiological processes (makes up 80-95% of the whole plant), which creates the vital environment in which only the activity of protoplasm is possible. Violation of the water balance of a plant can lead to its death.

Plants take water from the soil and air. In the process of evolution, plants acquired various adaptations related to the regulation of the water regime under specific conditions of their habitat.

According to these features, they are attributed to various ecologic. groups: xerophytes, succulents, hygrophytes, hydrophytes, mesophytes.

**Xerophytes** are plants which grow in dry environments where they often experience a shortage of water e.g. cacti and often succulents

**Succulents**- (from the Latin. succulentus, "juicy") - plants with special tissues for water storage.

**Hygrophytes** - plants that live in places with high humidity and / or soil

**Hydrophytes** are plants which grow in water e.g. water-lilies and rushes.

**Mesophytes** are terrestrial plants that are adapted to habitat in an environment with more or less sufficient but not excessive soil moisture



# Temperature or warm factor

- An important environmental factor. Closely related to growth and development, photosynthesis and transpiration. Chemical transformation of substances occurs at a certain temperature. In places with high temperature and humidity, for example in the tropics, growth and development occurs intensively and the vegetation cover of these plants is rich. In hot and arid places, the vegetation phases of development occur quickly and the plants bloom ahead of time, but their growth is small. Despite the fact that it is cold in the north, the vegetative periods of the plants pass normally.
- The decrease in temperature weakens the absorption capacity of the roots, so at this time the leaves of the plants occur.
- There are 4 main thermal regions on the Earth's surface : tropical, subtropical, temperate and frigid . Depending on the needs of plants in heat, thermophilic (thermophilic) and cryophilic (cold-resistant) species are distinguished. There are tropical plants that do not tolerate low temperatures and die, for example, a cocoa tree dies at a temperature of + 10 ° C. Many plants also love the average temperature. Pyrophyte plants are plants for the distribution of seeds which need fire (eucalyptus capsule).



# LIGHT FACTOR



- The main source of light is the sun. Only in the light of plants do plants create complex organic compounds from water and carbon dioxide in the air. Duration of lighting greatly influences the growth and development of plants. Requirements for lighting conditions in plants are not the same. For southern plants, the day length should be less than 12 hours (these are plants of a short day); for the northern - more than 12 hours (these are plants of a long day).
- In ecology, depending on the needs of plants for light, all plants are usually divided into 3 groups: **photophilous plants** - heliophytes; **Sciophyte** plants are shade-loving plants and shade-tolerant plants ..

# Air and wind factor

- Air is for plants a source of carbon dioxide consumed in the process of photosynthesis, and oxygen needed for respiration, as well as atmospheric moisture. The content of carbon dioxide in the air is reflected in photosynthesis, and, consequently, on the growth and development of plants. Increasing its concentration to a certain limit leads to increased photosynthesis, and at a very high concentration (2.5–20%), the intensity of photosynthesis decreases.
- Various impurities entering the air are harmful to plants. Particles are deposited on the leaves and sharply reduce the intensity of photosynthesis.
- Wind can have a direct and indirect effect on plants. Strong winds often break trees, turn them up by the roots. Constantly blowing in one direction, the winds cause various deformations of the growth of trees: the slope of the trunks, one-sided crown. On the high mountains and along the shores of the seas, flag-shaped tree crowns are found.





# Edaphitny or soil factor

- In relation to the soil, plants are subdivided into soil-permanent, soil-preserving and indifferent.

Depending on the chemistry of the soil, they emit eutrophic plants that always live on rich soils, oligotrophic plants that inhabit poor soils, nitrate plants, live on soils with an abundance of nitrates, halophyte plants growing on sodium-rich soils, calcephilic plants, saline plants - halophytes, etc.

- In connection with the mechanical composition of the soil, **psammophytes** living on a sandy substrate are distinguished, **lithophy** — plants of rocks and stones, **chemophites** — plants of gravelly and stony habitats, etc.



## BIOTONICAL (BIOTIC) RELATIONS

- Biotonic relations are based on the principles of competition and relationships with the animal world. The latter affects the survival of plants, pollination, the spread of fruits and seeds, etc.

## HUMAN IMPACT (anthropogenic)

- Man, on the one hand, contributes to the destruction of plants, on the other hand is engaged in enrichment of the flora.

## HISTORICAL CONDITIONS

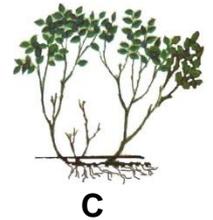
- Features of the structure of plants due to the long development of many existing species.
- In conclusion, it should be said that in nature there is a law of equivalence of all living conditions of plants.
- For plants, the substitution phenomenon is peculiar: climatic conditions are replaced by other climatic conditions, climatic - by edaphic and vice versa, climatic - by biotic and vice versa, edaphic - by biotic and vice versa.
- For example, the lack of moisture in the atmosphere can be replaced by soil moisture, etc.

# PLANT INTRODUCTION

- Introduction is the introduction of new plants into cultures outside their natural range. It includes both naturalization and acclimatization, but the distinction between these two concepts is very arbitrary, since it is impossible to select areas with a similar combination of environmental conditions for naturalization of this species outside the range of the introduced species. For any transfer of a plant from its range of distribution to a new area, it must in one way or another adapt to the new conditions of vegetation.
- Therefore, it is more correct to distinguish between simple and complex introduction. Simple introduction is the method of introducing new breeds without first changing their properties. When conducting a simple introduction, there are two ways: 1) a preliminary experiment and a study of its results; 2) preliminary study of the introduced breed and then experiment. Complex introduction is the method of introducing new breeds with preliminary changes in their properties. The conditions determining the possibility of introduction include: climate, soil, photoperiodism phenomena, stadial and cyclical development of plants.

# LIFE-FORMS(LIVING FORMS) OF PLANTS

- A - trees
- B - bushes (or shrubs)
- C - subshrub

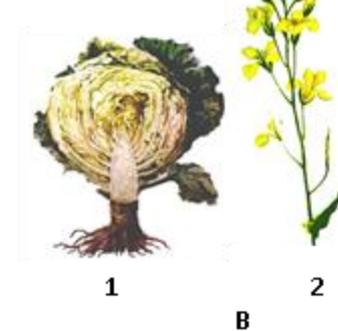


**Herbaceous plants** (without perennial overground shoots)

A - annual (without wintering buds, die every year)

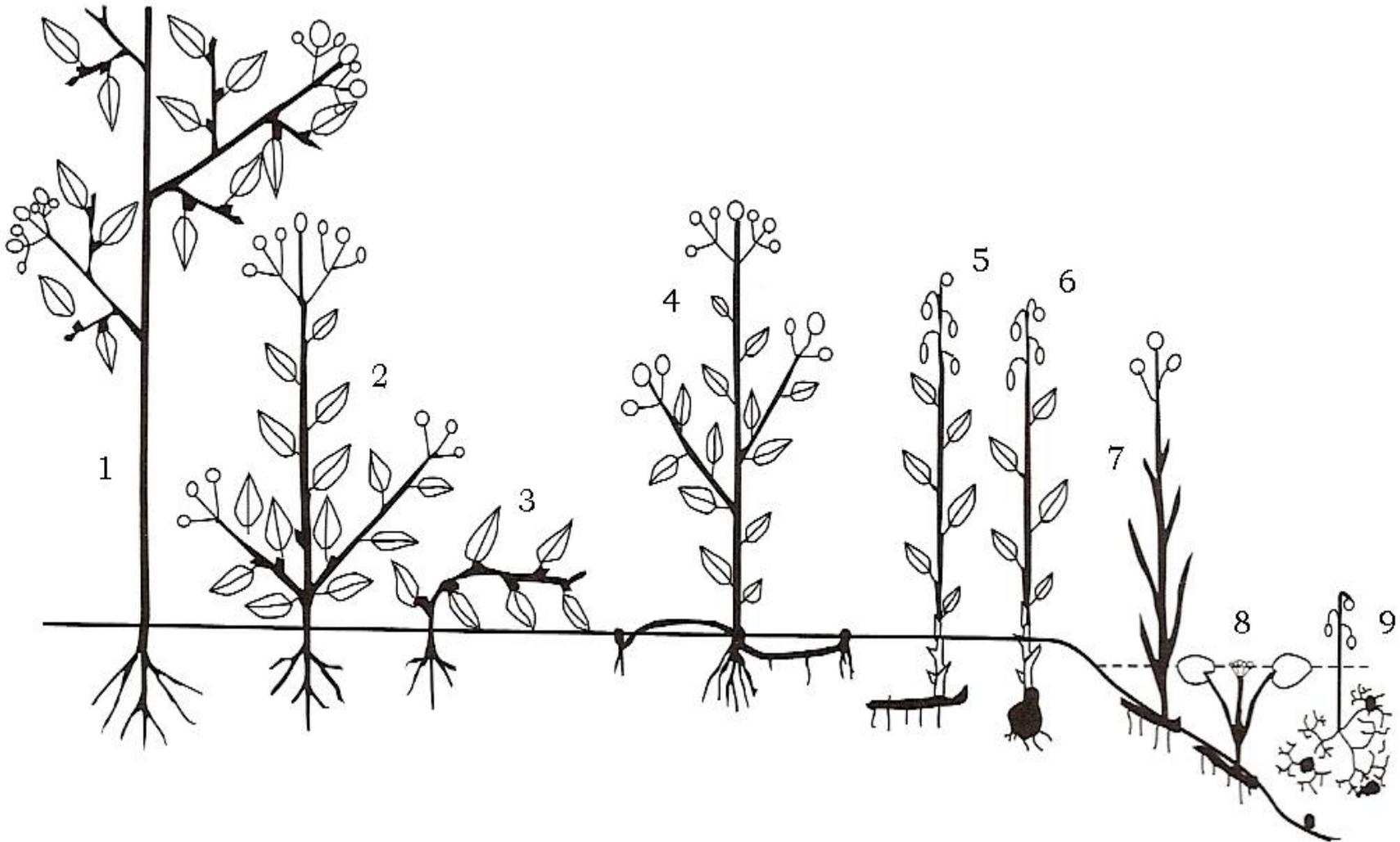
B - biennial (live two years):

C - perennial (overground part dies every year, underground organs - remain):



- **Raunkiaer employed three guiding rules in the selection of life-form characteristics:**
  - (1) The character must be structural and essential and must represent important morphological adaptation.
  - (2) The character must be sufficiently clear so that one can easily see in nature.
  - (3) All the life-forms employed must be of such nature as could constitute a homologous system and represent a single point of view or aspect of plants and thus enable a comparative statistical treatment of flora of different communities.
- On the basis of these principles, he recognized live life-form groups.
- **These groups are as follows:**
  - (1) Phanerophytes-a trees or shrubs that bears its perennating buds more than 25 cm above the level of the soil
  - (2) Chamaephytes-a plants whose buds are close to the ground
  - (3) Hemicryptophytes- any perennial plants that bears its overwintering buds at soil level, where they are often partly covered by surface debris
  - (4) Cryptophytesa- any perennial plants sthat bears its buds below the soil or water surface
  - (5) Therophytes-a plants that overwinters as a seed

The **Raunkiær system** is a system for categorizing plants using life-form categories, devised by Danish botanist Christen C. Raunkiær and later extended by various authors.



# Plant Communities

- **Plant community** (or "phytocoenosis", spelled also "phytocenosis", both rarely used) is a collection of plant species within a designated geographical unit, which forms a relatively uniform patch, distinguishable from neighbouring patches of different vegetation types.
- The **edificator or dominant** (lat. Aedificator - builder) is a type of plant with a strongly pronounced environment-forming ability, that is, a determining structure and, to a certain extent, the species composition of the plant community - phytocenosis. The dynamics of phytocenoses is one of the forms of change of plant communities, including irreversible or long-term cyclical changes of phytocenoses on the same area. The **dynamics** of phytocenoses occur under the influence of external and internal causes. Under the continuum of vegetation, understand the smooth transition of some plant communities in other /
- As a rule, the dynamics of phytocenoses are carried out from the least stable temporal, or serial, communities to indigenous, or climaxous, communities. In phytocenology, this provision is known under the name of the **climacterium** law .

# NATURAL VEGETATION

- The distribution of plants on the Earth surface has its own laws/This distribution is based on the horizontal(latitudinal) and vertical zonalites. Zonalites are related mainly to the climate.Every climate has is typical vegetation.

<https://www.youtube.com/watch?v=VUgNTa46C64>

# **NATURAL VEGETATIONS**

## **FORESTS**

**Tropical Rainforest**

**Tropical Deciduous  
Forest**

**Temperate Evergreen  
Forest**

**Temperate Deciduous  
Forest**

**Mediterranean Forest**

**Coniferous Forest**

## **GRASSLANDS**

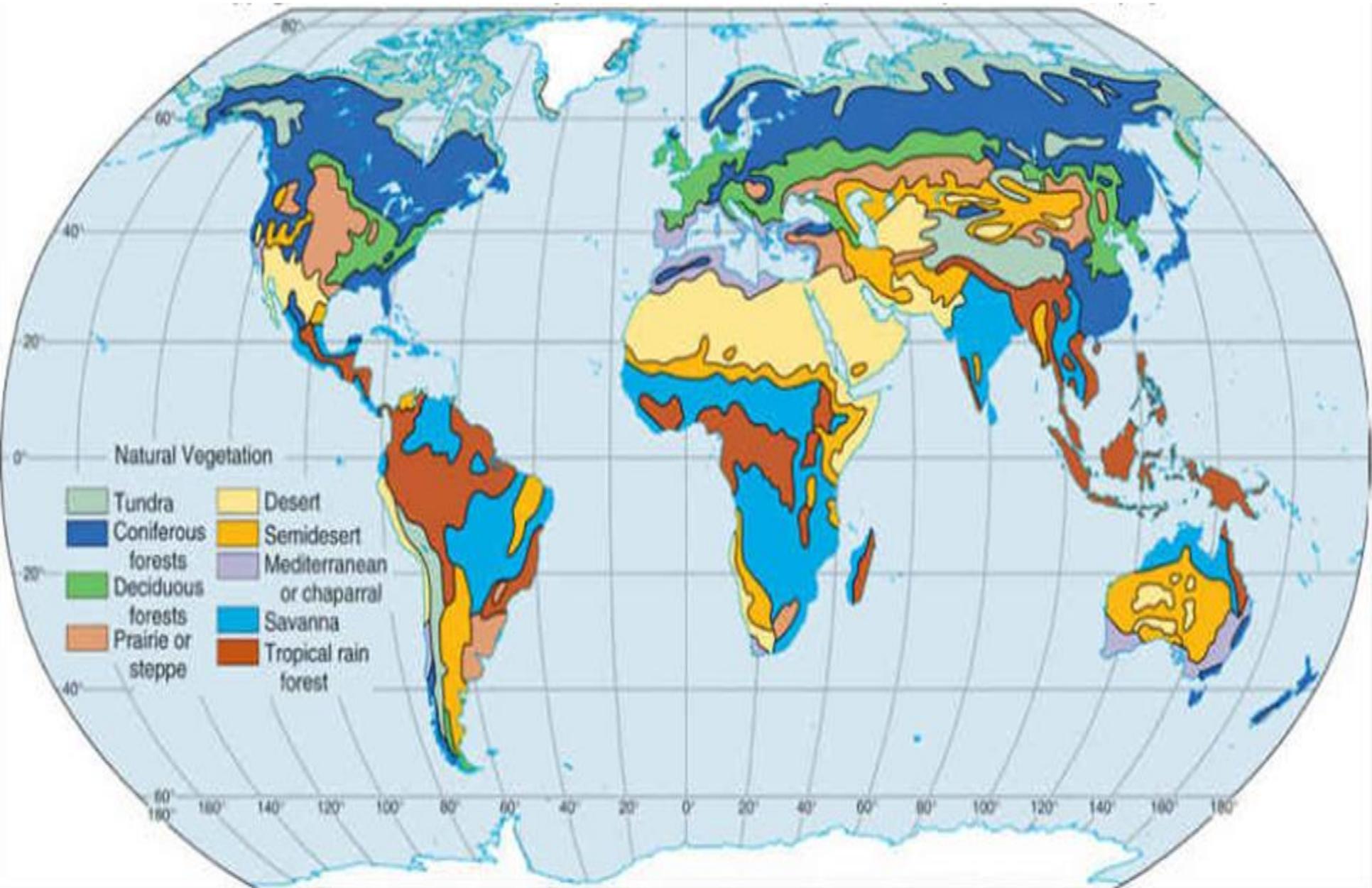
**Tropical Grasslands**

**Temperate Grasslands**

## **DESERTIC SCRUBS**

**Tropical Deserts**

**Tundra Regions**



# Vegetation of Azerbaijan

- Azerbaijan has a very rich flora, more than 4,500 species of higher plants have been registered in the country. Due to the unique climate in Azerbaijan, the flora is much richer in the number of species than the flora of the other republics of the South Caucasus. About 67% of the species growing in the whole [Caucasus](#) can be found in Azerbaijan.
- There are 172 endemic species of plants in Azerbaijan. Forests account for 11,4 % of total area of the country.
- The richness of Azerbaijan's flora and the variety of its vegetation results from the variety and richness of its physical-geographic and natural-historic conditions and from its compound history influenced by the remote floristic regions.

- 1. *Salix* or *Populus*
- 2. *Pinus* or *Juniperus*
- 3. *Quercus* or *Fagopyrum*
- 4. *Ulmus*
- 5. *Alnus*
- 6. *Castanea*
- 7. *Prunus* or *Amygdalus*
- 8. *Malus*
- 9. *Pyrus*
- 10. *Crataegus*
- 11. *Rosa*
- 12. *Hamamelis*
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- 712. *Cedrus*
- 713. *Abies*

**Thank you for attention!**

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