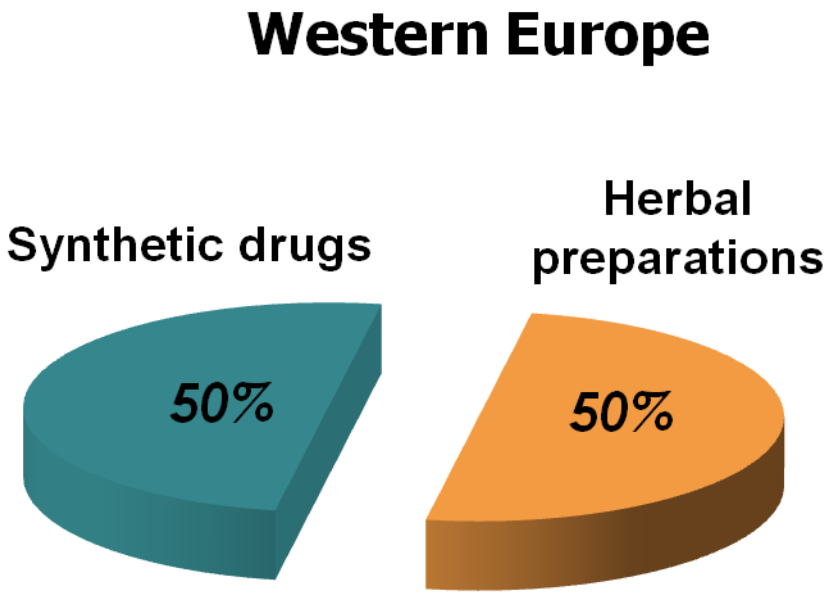
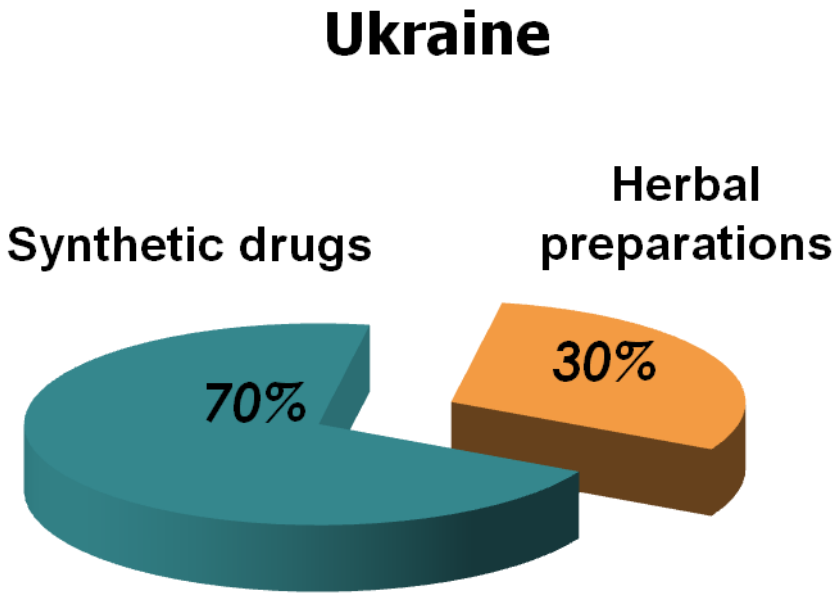
Medicinal plants resource science

The share of herbal drugs in the range of medicines





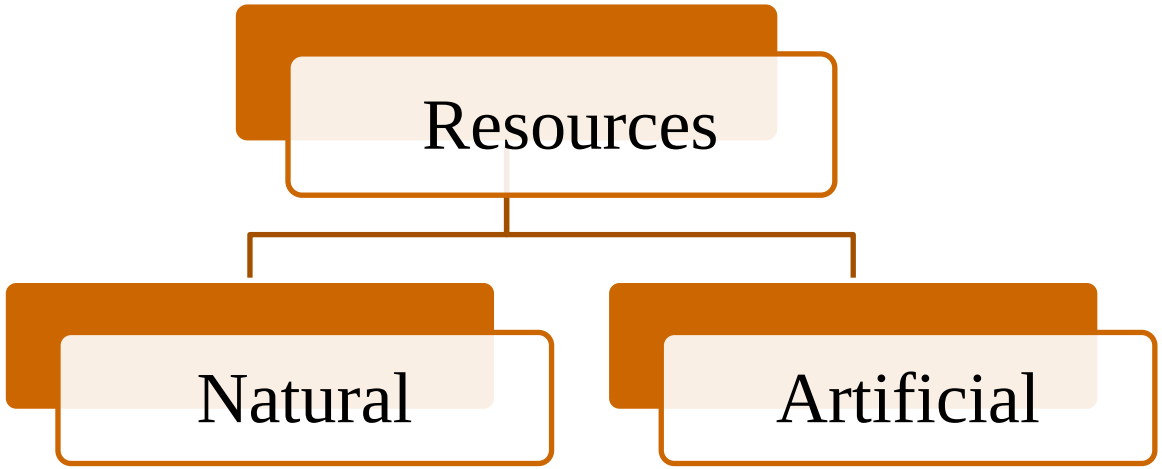
•Interest in traditional systems of medicine and, in particular, herbal medicines, has increased substantially in both developed and developing countries over the past two decades.

•Global sales of herbal products totalled US$ 60 000 million in a year.

What are resources?

A resource can be defined as any natural or artificial substance, energy or organism, which is used by human being for its welfare.

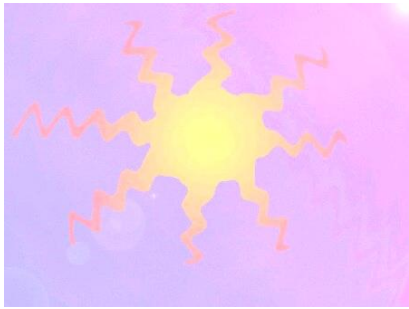
These resources are of two types:(a) Natural resources and (b) Artificial resources.



All that the nature has provided such as soil, air, minerals, coal, sunshine (sunlight), animals and plants, etc., are known as natural resources.

Classification of Natural Resources

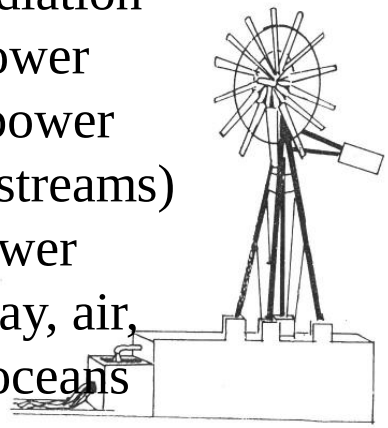
- Natural Resources
  - Exhaustible
    - Renewable
    - Non-renewable
  - Inexhaustible



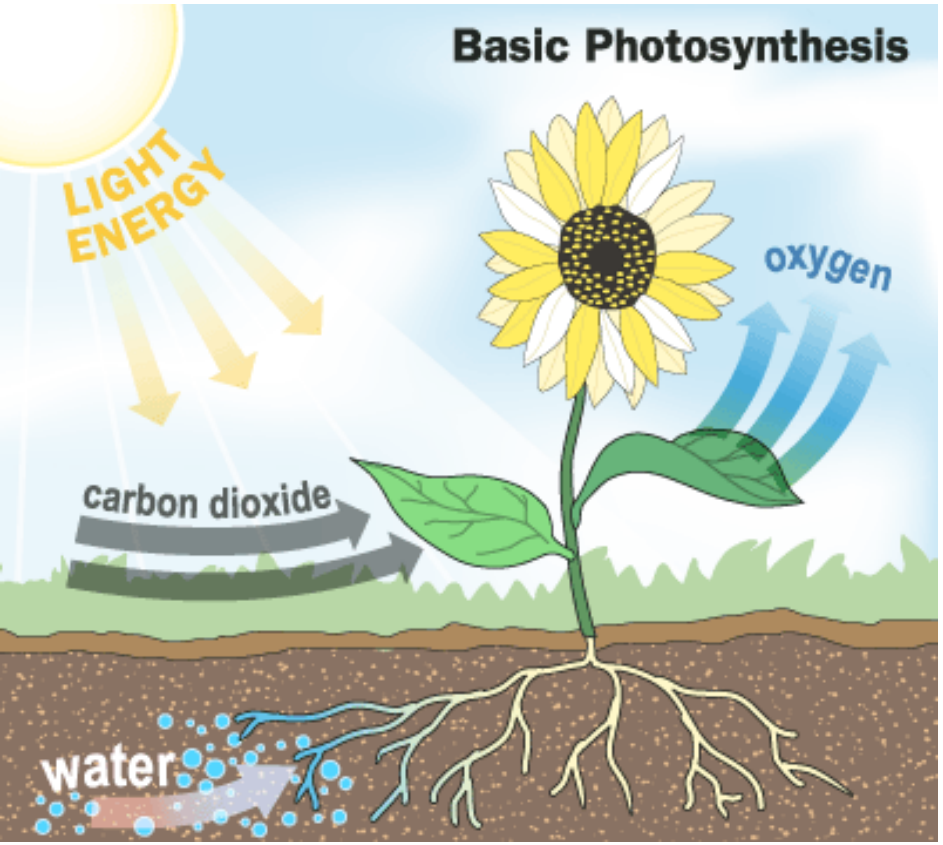
- animals
- plants

- coal
- oil
- copper
- iron
- rare plants and animals

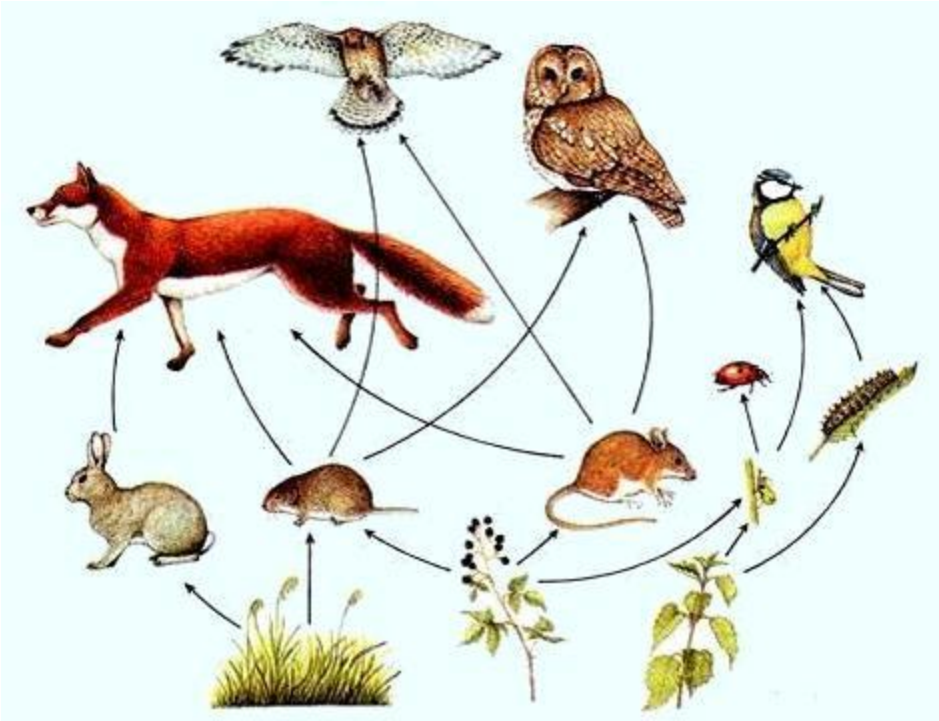
- solar radiation
- wind power
- water power (flowing streams)
- tidal power
- sand, clay, air, water in oceans



Plants are a fundamental part of ecosystems



the food chain



Plants are primary producers for the food web

NATURAL PLANT RESOURCES

Natural plant resources are plants, that are used or may be used in perspective in direct or indirect ways.

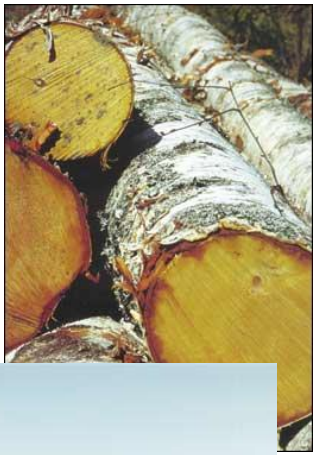
Resource species: the species from which a product is harvested.

Product: any part of a plant or animal that is harvested for human use or consumption.

Plant Drug Sources

- Wild plants
- Cultivated plants
- Tissue culture
- Imported raw materials

The Aims of Directly or Indirectly Uses of Plant Resources



- **Environmental (ecological)**
- **Recreational use (organized rest, tourism)**
- **Sanitary (spa treatment)**
- **Cultural and educational (aesthetic education - ornamental plants)**
- **Scientific uses (**the pea plants were used to derive Gregor Mendel's laws of genetics)
- **Economical**
  1. Herbal drugs
  2. Industrial raw material
  3. Spicy-aromatic raw material
  4. Food
  5. Forage grasses
  6. Beekeeping needs
- **Hunt, fishing (**provide habitat)

Plant resources of Ukraine are divided into resources of national and local significance (the Law on Plant world)

National significance

local significance

The others

The objects of flora within:

a) inland waters, the continental shelf and exclusive (maritime) economic zone of Ukraine;

•surface waters (lakes, reservoirs, rivers, canals) which are located and used in more than one area (oblast);

•the Natural and Biosphere reserves, National parks, botanical gardens, and dendrological parks of national significance.

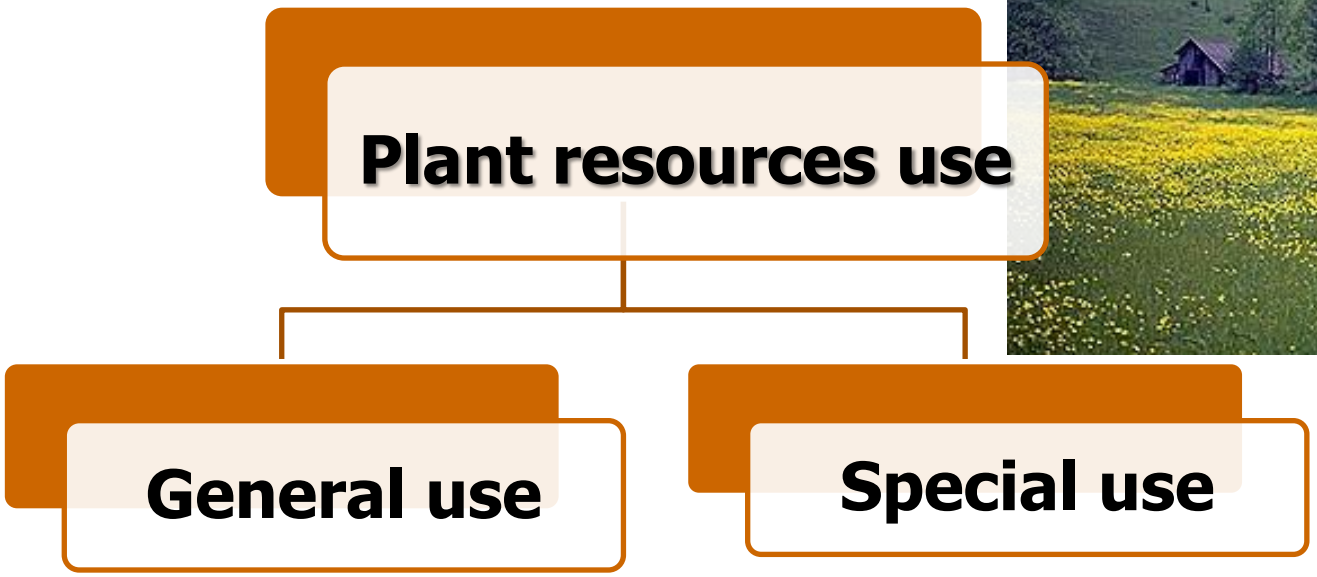
b) Forest resources of national importance.

c) Species which are listed in the **Red Book of Ukraine**

d) Species of natural plant communities that are listed in the **Green Book of Ukraine.**

Form of use of plant resources in Ukraine

The collection of wild medicinal and other valuable plants is categorized as either “general” or “special” use of plant resources



General Use of plant resources in Ukraine

Without a special permission

all citizens of Ukraine for the gathering of wild plants for personal consumption (i.e. nonprofit); ***(except for* objects of *RDB, and GDB)***

1. **Collection of medicinal and technical raw material**
2. **Gathering of flowers, berries, fruits, mushrooms, etc.**
3. **Recreational**
4. **Sanitary use (spa treatment)**
5. **Cultural and educational use**

Special Use of Plant Resources in Ukraine

1. **permission is required:**
all commercial use (extraction, gathering, etc.) from the natural environment.
Legal entities and individuals for profit from realization of these resources or products of their processing

2. **without permission *(except for* objects of *RDB, and GDB):***

- **owners of land**
- **users of land** granted to them for the purpose

Medicinal plant resources science is a science that study the natural resources of medicinal plants, their distribution, methods of collection, extended recovery in the natural environment

Related Branches of Knowledge

Resource assessment: an evaluation of some aspect of the resource based on information from a variety of sources. It can include socio-economic issues, market issues, or the quantity and quality of the resource.

Natural resource management is a discipline in the management of natural resources such as land, water, soil, plants and animals, with a particular focus on how management affects the quality of life for both present and future generations.

Biometrics: the application of statistical methods to the measurement of biological objects.

Tasks of Plant Resources Science

theoretical:

- the development of methodology for long-term and one-time resource assessment of the region
- ecological zoning of the region
- compilation of evidence-based recommendations for the protection of plant resources
- work out technologies, which are environmental friendly and based on efficient use of resources.

practical:

- study of reserves of medicinal plants
- finding their placement in the territory
- resource mapping
- zoning of medicinal plants collecting
- planning of collecting on nomenclature and volume in order to the efficient use of natural resources of medicinal plants

STAGES OF PLANT RESOURCE RESEARCH

1. Selection of objects for resource research
2. Identification of specific areas (regions), where the inventory will be conducted
3. Processing official and literary materials that contain information about the flora, plant communities and plant resources of certain territory. Survey of the local population.
4. Field works (determine productivity of plants)
5. Analysis of data obtained during the field works, estimation of resource qualitative and quantitative characteristics, including annual allowable harvestable amounts of species, and analysis of the determining factors that threaten their existence of the natural resource in a transformed environment.

Regional investigations of plant resources are carried out on a periodical basis. Usually once in 5 years

Use of Medicinal Plants in Ukraine: legislation.

The use and protection of the wild flora is governed by several legal instruments

- **Convention on Biological Diversity** (Rio de Janeiro, 1992)
- Pan-European Biological and Landscape Diversity Strategy
- the Constitution of Ukraine
- the Law on Environmental Protection **(1991)**
- the Law on Plant world **(1999)**
- the Law on Nature Reserve Fund of Ukraine **(1992)**
- the Forest, Water and Land Codes of Ukraine
- the Civil and Criminal Code of Ukraine
- the Red Data Book of Ukraine
- the Green Data Book of Ukraine
- **And others**

International Agencies Dealing with Wildlife

There are various agencies of international levels which take care of wildlife. Some of them are given below

- **World Wildlife Fund for nature (WWF)** : It is an international organization formed in 1961 and is engaged in protection of wildlife.
- **International Union for Conservation of Nature and Natural resources (IUCN)** or **World Conservation Union (WCU)** international organization founded in 1948 to encourage the preservation of wildlife, natural environments, and living resources. Its members include private individuals, nongovernmental organizations and governments. The organization publishes the **IUCN Red List**, compiling information from a network of conservation organizations to rate which species are most endangered.

IUCN category	Description of the category
Ia, Strict Nature Reserve	strictly protected areas, where human visitation, use and impacts are strictly controlled and limited can serve s for scientific research and monitoring.
Ib, Wilderness Area	protected areas, retaining their natural character and influence, without permanent human habitation, which are protected so as to preserve their natural condition.
II, National Park	are large natural or near natural areas set aside to protect large-scale ecological processes, along with the complement of species and ecosystems characteristic of the area, which also provide a foundation for environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities.
III, Natural monument or Feature	are set aside to protect a specific natural monument, which can be a landform, sea mount, submarine cavern, geological feature such as a cave. They are generally quite small protected areas and often have high visitor value. It includes: **Natural geological features**: such as waterfalls, cliffs, craters, caves, fossil beds, sand dunes, rock forms, valleys and marine features such as sea mounts or coral formations; **Cultural sites with associated ecology**: such as archaeological/historical.
IV Habitat/Species Management Area	usually help to protect, or restore: 1) **flora species** of international, national or local importance; 2) **fauna species** of international, national or local importance including resident or migratory fauna; and/or 3) **habitats**.
V, Protected Landscape/ Seascape	where the interaction of people and nature over time has produced an area of distinct character with significant ecological, biological, cultural and scenic value.
	conserve ecosystems and habitats, together with associated cultural values and traditional

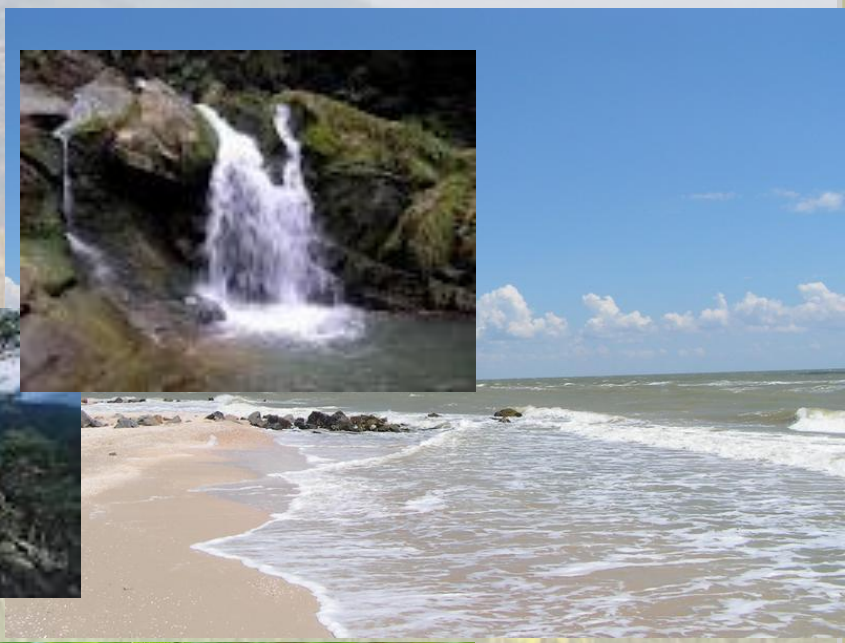
The protected areas of the highest rank, the objects of which are the communities included in the **Green Book of Ukraine,** are listed below:

- **Category Ia of the IUCN classification**
- Biosphere preserves: “Askania-Nova”, Danube, Black sea and Carpathian biosphere preserve

- **Category Ib of the IUCN classification;**
- Nature preserve: Dnieper-Oril, “Yelanetsky steppe”, Kazantyp, Kaniv, Kara Dag, Crimean, Lugansk, “Medobory”, “Cape Martyan”, Opuk, Polissia, Rivne, “Roztochya”, Ukrainian steppe, Cheremsky, Yalta mountain-forest nature preserves –

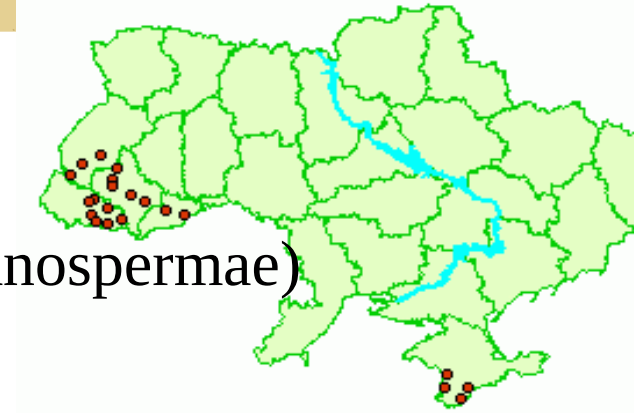
Category II of the IUCN classification

National nature parks “Sacred Mountains”, Azov-Syvash, Vyzhnytsky, Desna-Starogutsky, Carpathian, "Podilski Tovtry", “Prypyat-Stohid”, "Synevyr", “Skolivski Beskydy”, “Shatskiy”, “Uzhansky” –



Uses of the **IUCN Red List:**

- Draws attention to the magnitude and importance of threatened biodiversity
- Identifies and documents those species most in need of conservation action
- Provides a global index of the decline of biodiversity
- Establishes a baseline from which to monitor the future status of species
- Provides information to help establish conservation priorities at the local level and guide conservation action
- Helps influence national and international policy, and provides information to international agreements such as the Convention on Biological Diversity (CBD) and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).



Taxus baccata L.
Vascular plants.
Division **Pinophyta** (Gymnospermae)
Family **Taxaceae**

Scientific importance. Relict (tertiary) species with disjunctive habitat.
Status. III category.
Distribution. Ukrainian Carpathians, Crimean mountains.
The species is also widespread in mountain regions of Western and South-Eastern Europe, Mediterranian region, Middle East, Southern Iran, Caucasus.
Growing areas. Hornbeam-beech, beech and beech-coniferous forests. On carbonate rocks, often on calcareous rocks, in ravines.
Quantity. There are about 40 places of growing. Populations are local, not numerous, their number is constantly decreasing.
Reasons of quantity changes. The mass felling in the past for valuable timber.
General characteristic. Coniferous tree or a bush 3 – 16 m high,
Conservation measures. Listed as endangered in the Red Book of Ukraine. Preserved in Yalta mountain-forest nature preserve and Carpathian biosphere preserve.
Information sources.

Green Book of Ukraine

It is a public document that summarizes information about the current status of rare, endangered and common natural plant groupings in Ukraine that need protection and are important as part of biodiversity. This document is the basis for developing measures to protect or unsustainable use of natural plant groupings, defines the categories of rare, endangered and common natural plant groupings listed in the Green Book of Ukraine.

- The Green Book of Ukraine contains the following information: binomial scientific name of the plant community, its synphytososological index, class, category, distribution in Ukraine, physico-geographical conditions, biotope, phytocoenotic, autphytososological and botanical-geographical importance, coenotic structure and floristic core, renewal potential, type of preservation regime, necessity of protection implementation, biotechnical and sosotechnical recommendations, information sources, map of the group distribution.

Beech periwinkle forest *(Fagetum (sylvaticae) vincosum (minoris))*

Alder fern forest

(Alnetum (glutinosae) matteucciosum (struthiopteris))

Feather grass wilted sage steppe

(Stipetum (lessingianae) salviosum (nutantis))

Bogbean peat-moss meadow

(Menyantheto (trifoliatae)–Scheuchzerietum (palustris) sphagnosum (S. palustris))

Selecting objects of resource study in Ukraine

1. At the regional resource surveys, the first task of the preparatory period is the choice of medicinal plants, as object of resource study in this area.
2. The list of objects of study includes the most valuable medicinal plants whose harvest is planned and also rare species of the "Red Book of Ukraine" in this area.
3. Expedition may be entrusted the study of introduced woody plants raw materials, such as horse chestnut, Japanese pagoda tree**,** black chokeberry et al. In addition, in the objectives of the study species with export value may be included (angelica, white dead-nettle, mullein), and prospective plants being tested in clinical studies.

No need to study the resources of plants, which are:

- widely cultivated ;
- sufficiently large number of available growing areas;
- Woody plants, if their resource is well known and many times exceeding the needs of their raw materials;
- Typically, the employer must provide to the contractor a list of herbs that are subject to resource assessment.