

Topic #8

Ecological systems. Ecosystem homeostasis. Biological productivity and ecosystem dynamics

Motivation

Vernadsky said: “Not a single living body exists in a free state on Earth. All bodies are inseparably and continuously, first of all, through nutrition and breathing - with their surrounding material and energy environment. Outside of it, if the conditions are met, they cannot exist.”

Living organisms have a close connection between themselves and the provision of habitat: fish live in water, wolves, foxes, hares - in the forest. Mutually supporting each other's vital functions, they provided stable communities, and in combination with the preservation of the habitat, a sustainable system, which was called “ecosystem” (from the Greek “ekos” - dwelling, habitat).

Knowledge of the ecosystem environment of the habitat allows a person to adapt to the environment. Knowledge of the ecological productivity of ecosystems and the possibility of quantitative accounting of energy flows are of extreme practical importance. The primary production of agrocenoses and their exploitation by people, taking into account environmental conditions, is the main source of food supplies for humanity. Secondary products obtained from agricultural and mental animals are no less important, since the image includes a number of animal amino acids essential for humans, which are not found in plant nutrition. Accurate calculations of energy flow and the scale of productivity of ecosystems make it possible to regulate the cycle of substances in them in such a way as to achieve the greatest yield of products beneficial to humans. In addition, it is necessary to keep the permissible restrictions on limiting the use of plant and animal biomass well. for system security reasons so as not to undermine their productivity.

Purpose of the classes: to gain knowledge about the electrical system, to get acquainted with the driving changes and components of the biological productivity of the ecosystem.

Questions for oral questioning:

1. The concept of ecosystems, learning about biogeocenoses.
2. Ecological groups of organisms: producers, consumers and decomposers.
3. Energy flow in ecosystems.
4. Biological productivity of the ecosystem: primary and secondary production, pyramid rule, distribution of biological products.
5. Ecosystem dynamics: cyclical changes, succession and digression, agroecosystems.

List of knowledge and practical skills

After mastering the topic, the student should know: the concepts of basic systems, main ecological groups of organisms, parameters of ecosystem dynamics, mechanisms for maintaining the stability of the biocenosis.

After mastering the topic, the student must be able to: compare natural and artificially created ecosystems, analyze different options for ecosystem productivity.

Independent work of students in class

1. Solving a situational professionally oriented problem, documenting the solution in a protocol.
2. Watching an educational video on lesson topics.
3. Completing test tasks on the topic “Ecological systems”.

Reference material

An ecological system is any collection of bodies and inorganic components in which the circulation of substances can occur.
development.

“Ecosystem” and “biogeocoenosis” are essentially similar concepts, but if the first of them is applicable to designate systems that ensure circulation of any rank, then

“biogeocoenosis” is a territorial concept, transferable to such areas of land that occupied by elements of vegetation cover - phytocenoses.

Food chain - rows in which you can track the paths of consumption of initial doses of energy.

The trophic level is the location of each link in the food chain.

Grazing chains (or grazing chains, or consumption chains) are food chains that start with photosynthetic organisms, called.

Detrital decomposition chains are chains that begin with dead plant remains, carcasses and animal excrement.

The primary production of a community is the organic mass created by plants per unit of time.

Gross primary production is the amount of substances produced in plants per unit of time at a given rate of photosynthesis.

Secondary production is an increase in the mass of consumers over time.

Rules of the production pyramid: at each previous trophic level, the amount of biomass produced per unit of time is greater than at the next one. Graphically, this rule is expressed in the form of a pyramid, tapering upward and formed by stacked figures of equal height, the length of which corresponds to the scale of production at the corresponding trophic levels. The product pyramid reflects the laws of energy consumption in food chains.

The rule of the biomass pyramid: the total mass of plants turns out to be greater than the biomass of all phytophages and herbivores, and the mass of those, in turn, increases the mass of all predators.

In those trophic chains where energy transfer occurs mainly through the predator-prey connection, **the rule of the pyramid of numbers is often followed** : the total number of individuals participating in the food chain with each transmission link. This is due to the fact that predators, as a rule, are larger than the objects of their food, and one predator needs several or many prey to maintain biomass.

Ecosystem dynamics:

Cyclic changes in the environment reflect the daily, seasonal and long-term periodicity of external conditions and the manifestation of endogenous rhythms of the body.

Daily transformations are usually expressed the more strongly, the more significant the difference in temperature, humidity and other environmental factors between day and night.

Seasonal variability is expressed in terms of not only the state and activity, but also the quantitative indicator of individual species depending on their reproduction cycles, seasonal migrations, the death of individual generations during the year, etc.

Long-term variability depends on year-to-year changes in meteorological conditions (climatic fluctuations) or other variables operating in the community (for example, the degree of river flooding).

Digression is a gradual simplification of the structure of a community, impoverishment of its composition, and a decrease in productivity under the influence of external external factors.

succession is a legitimate, directed process of environmental change resulting from the interaction of living organisms between the environment and their abiotic environment.

Primary successions begin in small places of life - on rocks, cliffs, river sediments, shifting sands, etc.

Secondary successions are restoration changes. They begin if in already established communities the established relationships of organisms are partially disrupted, for example, the vegetation of one several layers or tiers is removed (as a result of cutting down, fire, plowing, etc.).

The succession process consists of several stages : 1) the emergence of unoccupied life on the site; 2) departure of various persons or their rudiments to it; 3) their establishment in a given area; 4) their competition with each other and displacement of certain species; 5) transform living bodies with habitats, gradual changes in conditions and relationships.

A successional series is a series of successive successive series that succeed each other in a successional community.

Types of successional changes: 1) with the participation of both autotrophic and heterotrophic populations.

2) with the participation of only heterotrophs.