

UNIT 1. ECOLOGY AS A SCIENCE

Key words

relationships – відносини

living thing – жива істота

cell – клітина

environment – навколишнє

середовище

habitat – природне середовище

to depend (on) – залежати (від)

seed – зерно

to affect – впливати

impact – вплив

layer – шар

ecosystem – екосистема

to contain – містити

term – термін

species – вид, види

to originate – походити

concept – поняття

to vary – варіювати

to alter – змінювати

to exist – існувати

to accept – сприймати

Ex.1.1. Read the text and answer the questions:

1. Where does the word 'ecology' come from?
2. What does it mean?
3. How did the science develop?
4. What is the subject of ecology?

Ecology Defined

Ecology studies the relationships between living things and their environment. The term 'ecology' comes from two Greek words *oikos* (which means 'house' or 'place to live') and *logos* (which means 'study'). So, ecology studies the 'houses', or environment, of living organisms – all their surroundings, including other animals and plants, climate and soil. Nobody knows when the word 'ecology' first appeared, but German biologist Ernst Haeckel was the first to define it, in 1869.

Although the science of ecology is a new one, people have been studying ecology and applying their knowledge for thousands of years. Prehistoric people had to know something about the ecology of wheat and corn before they could successfully raise crops of these plants. Theophrastus, an early Greek botanist, is considered to be 'the first true ecologist' because he was the first to write about plants in terms of their living places, or *habitats*, such as forest and marsh. The Indians of the North American plains knew a lot about the ecology of the bison

on which their lives depended. Today we often use ecological knowledge without being aware of it; for example, when we want to have a lawn in a shady place, we plant seeds of the grass that grows well in shade.

However, most people don't think ecologically. When they see a bird or a wildflower, their first question is: *What is it?* They want to know the names of the living things around them in nature. And only some people ask the next question: *What does it do?* They are interested in the organism's role in its environment and how it affects and is affected by other organisms. This is what ecology studies.

Ex.1.2. Translate the words from English into Ukrainian.

Ecology, term, organism, biologist, prehistoric, botanist, bison, ecologically, nature, person, role.

Ex.1.3. Decide whether the statements are true or false according to the text.

1. The word 'ecology' first appeared in 1869.
2. Ecology is a new science.
3. People have been using ecological knowledge since 1869.
4. To use ecological knowledge you have to be aware of it.
5. Thinking ecologically means being interested in the relationships between living things and their surroundings.

Ex.1.4. Translate into Ukrainian.

Between, although, before, because, such as, which, often, without, however, around, perhaps.

Ex.1.5. Choose the option (a, b or c) to translate the words in the first column.

- | | | | |
|------------------------|----------------|----------------|------------------|
| 1) <i>science</i> | a) навчання | b) наука | c) предмет |
| 2) <i>marsh</i> | a) рівнина | b) болото | c) височина |
| 3) <i>the same</i> | a) інший | b) такий самий | c) якийсь |
| 4) <i>to study</i> | a) вивчати | b) проводити | c) знати |
| 5) <i>relationship</i> | a) споріднений | b) зв'язаний | c) взаємозв'язок |
| 6) <i>include</i> | a) включати | b) вивчати | c) виключати |
| 7) <i>soil</i> | a) сіль | b) ґрунт | c) волога |

- | | | | |
|----------------------|-------------|----------------|--------------|
| 8) <i>to depend</i> | a) залежати | b) взаємодіяти | c) проводити |
| 9) <i>forest</i> | a) ліс | b) поле | c) ріка |
| 10) <i>thousands</i> | a) сотні | b) десятки | c) тисячі |

Ex.1.6. Explain the meaning of the Greek words: oikos, logos, habitat.

Ex.1.7. Find Ukrainian equivalents to the English words and word combinations.

To be aware of, to come from, to be sure, to apply one's knowledge, in terms of, to raise crops.

Ex.1.8. Choose the best statement to discover the main idea of each paragraph of the text above.

1. A) Ecology is a new science.
B) Origin of the term 'ecology'.
2. A) The Indians of North America are the first ecologists.
B) People have been using their ecological knowledge for thousands of years.
3. A) Ecology studies the role of living things in their environment.
B) Ecology studies what birds and wildflowers do in their environment.

Ex.1.9. Read the text and do the exercises below.

Ecology as a Science

Modern ecology is focused on the concept of ecosystem, a functional unit consisting of interacting organisms and all aspects of the environment in a specific area. It contains both the nonliving (abiotic) and living (biotic) components through which nutrients are cycled and energy flows.

Constant interactions between living organisms and their physical environment bind these components into a stable system. The state of balance in any ecosystem is self-sustainable so that even slight imbalances are corrected before they become severe, irreparable and fatal.

Ecology is a multidisciplinary science. Facts about ecological systems are drawn from biology, geology, chemistry, physics, history, physiology, anthropology, including various branches of geography: hydrology, soil science, geomorphology, biogeography, etc. Originally environmental biology was considered ecology. Modern ecology has to deal with environmental problems caused by human activities.

The science of ecology has the following areas of study. They are plant and animal ecology, population ecology, community ecology, paleoecology. A new term 'social ecology' was introduced to show interaction of man, society and nature, close interdependence of social and natural factors. Other ecological approaches concern specialized areas. Systems ecology, concentrating on input and output analysis, has stimulated the rapid development of applied ecology, concerned with the application of ecological principles to the management of natural resources, agricultural production, and problems of environmental pollution.

In applied ecology, basic ecological principles are applied to the management of populations of crops and animals, so that yields can be increased and the impact of pests reduced. Applied ecologists also study the effect of humans on their environment and on the survival of other species. Theoretical ecologists provide simulations of particular practical problems (e.g., the effects of fishing on fish populations) and develop models of general ecological relevance.

Nowadays it is evident that some of the most pressing problems of men-expanding population, food scarcities, environmental pollution, and all the sociological and political problems are to a great degree ecological.

bind – пов'язує

applied – прикладний

to deal with – мати справу з

food scarcities – дефіцит їжі

Ex.1.10. Here are the answers to some questions on the text. What are the questions?

1. Ecology deals with the organism and its environment. (What?)
2. Interactions between individuals, between populations and between organisms and their environment form ecological systems. (What?)

3. The state of balance in any ecosystem is self-sustainable so that even slight imbalances are corrected before they become severe, irreparable and fatal. (Why?)

4. Modern ecology has to deal with environmental problems caused by human activities. (What?)

5. Facts about ecological systems are drawn from biology, geology, chemistry, physics, including various branches of geography. (Where?)

6. The ecosystem is a functional unit consisting of interacting organisms and all aspects of the environment in any specific area. (What?)

7. The most pressing problems of men-expanding populations, food scarcities, environmental pollution are to a great degree ecological. (What kind of?)

Ex.1.11. Complete the sentences.

1. Ecology is a study of
2. Modern ecology is focused on
3. The state of balance in any ecosystem is
4. Ecology is a multidisciplinary science drawing facts from
5. The science of ecology has such areas of study as
6. The term 'social ecology' was introduced to
7. Applied ecologists study

Ex.1.12. Match the following terms with their proper definitions.

- | | |
|--------------------------|--|
| 1. Physiological ecology | a) the study of the ecology of fossil organisms |
| 2. Behavioral ecology | b) the study of the organization and functioning of communities, which are assemblages of interacting populations of the species living within a particular area |
| 3. Population ecology | c) the study of the relationships between individuals |
| 4. Community ecology | d) the study of the food-gathering techniques of individuals, the survival adaptations against predation and mating |
| 5. Paleoecology | e) the study of the processes that affect the distribution and abundance of animal and plant populations |

Ex.1.13. Read the text and answer the questions.

1. What were people focused on many centuries ago?
2. What did they study in the late 1800s and early 1900s?
3. What is the main goal of modern ecology?

Ecology: Development and Challenges

Although ecological knowledge has been used by people for thousands of years, ecology is one of the newest sciences. For many centuries, people concentrated on naming the plants and animals they discovered and on describing the structure of the dead specimens they collected. Gradually, as the question ‘What is it?’ was more easily answered, people began studying the effects of the environment on living organisms. During the 1800s, for example, scientists investigated the effects of day length on bird migration and the effects of humidity on the development of insects. Hundreds of books were written on the behavior of animals and on the distribution of plants and animals over the earth.

The emphasis was still on individual organisms. In the late 1800s and early 1900s, however, scientists began to study *populations* of organisms rather than individuals. At that time they realized that all of the populations of plants and animals in a certain area make up a sort of *community*, with different kinds of organisms having different ‘jobs’ in the community. Studies of nature became broader. In 1935, the word *ecosystem* appeared to describe all living communities of an area including nonliving parts of their environment. The earth is a huge ecosystem. Other ecosystems are forests, lakes, meadows, vacant lots, or even your back yard.

One of the main goals of ecologists today is to investigate ecosystems. The challenge of ecology is to understand how ecosystems ‘work’ and how they change eventually.

specimens – зразки

investigate – досліджувати

humidity – вологість

distribution – розподіл

emphasis – акцент, головна увага

community – спільнота

Ex.1.14. Decide whether the following statements are true or false according to the text above.

1. For many centuries people were staying focused on naming species they found in nature.
2. People began to study ecosystems many centuries ago.
3. Studying groups of living organisms led scientists to the ecosystem concept.
4. The term 'community' is used to describe organisms, their environment and the relationship between them.

Ex.1.15. Find Ukrainian equivalents to the words.

Concentrate, structure, collect, effect, migration, individual, organism, population, sort, ecosystem, ecologist.

Ex.1.16. Match the English word combinations with their Ukrainian equivalents.

- | | |
|-------------------------|-------------------------------------|
| 1) ecological knowledge | a) незайняті ділянки землі |
| 2) many centuries | b) тривалість дня |
| 3) dead specimens | c) екологічні знання |
| 4) living organisms | d) рослинне угруповання (фітоценоз) |
| 5) day length | e) мертві зразки |
| 6) bird migration | f) вплив вологості |
| 7) effect of humidity | g) багато століть |
| 8) behaviour of animals | h) величезні екосистеми |
| 9) huge ecosystems | i) живі організми |
| 10) vacant lots | j) поведінка тварин |
| 11) plant community | k) міграція птахів |

Ex.1.17. Fill in the gaps with appropriate words from the text above.

1. The study of the relationship between plants, animals, and their environment is called
2. The movement of living things from one place to another is
3. ... is a group of plants or animals living in the same surroundings.
4. The word ... is used to describe all living communities and nonliving parts of their environment.

Ex.1.18. Open the brackets using the past simple tense.

In the 1960s – 1970s, many Americans (to become) concerned that pollution was causing health problems. Congress (to respond) by passing laws to revive polluted lakes and rivers, improve quality of the air and save animal species. In the early 1980s, new environmental problems (to emerge). Scientists (to discover) that pollution in one country (can) affect neighbouring countries. Some experts (to warn) that CO₂ could cause the earth's temperature to rise. Scientists also (to discover) that some chemicals were destroying the earth's protective ozone layer.

Ex.1.19. Discuss the following questions:

1. When did the first living things appear on our planet?
2. What is the biosphere?

Ex.1.20. Read the text and check your answers to the questions above.

Life on the Planet Earth. The biosphere

The Earth is about 4.6 billion years old. The first living cells emerged between 4 billion and 3.8 billion years ago. Man appeared only 50,000 years ago and was just an ordinary living being among others. 10,000 years ago people started farming and settling down. They began to alter their surroundings and the environment deliberately in efforts to make their life more secure and comfortable. Then they started to use metals, invented writing, developed science, built towns and cities that eventually led to the industrialisation and population growth 250 years ago.

Although man is the most intelligent form of life on the planet and can change his surroundings in different ways, he is just as dependent upon the natural world as every other species, animal and plant. Man is a part of nature and he can't ignore its laws otherwise the results might be disastrous – and not only for man.

The place on Earth's surface where life dwells is called the *biosphere* – a thin layer which is the meeting place of land, air and water. Life forms live in every part of the Earth's biosphere, including soil, hot

springs, inside rocks at least 6 mi deep underground, the deepest parts of the ocean, and at least 5.5 mi high in the atmosphere. Only the hardest creatures can survive high in the mountains or deep in the oceans.

The biosphere includes a great number of plants, animals, and other life forms of the planet, many of them are yet to be discovered. The biosphere is a relatively thin life-supporting layer around the Earth containing living organisms, which is strongly influenced in composition and structure by the living organisms. Part of the biosphere containing the highest concentration of living matter varies from a few meters in deserts and tundra to a hundred meters in tropical, forest regions and oceans.

The idea of the biosphere appeared more than a century ago. It's a complex system of energy use and material cycling. This system runs on the energy flowing into it from the sun and it gives off energy (primarily as heat) to space.

The biosphere can be divided into two parts, living and nonliving, or biotic and abiotic. The biotic part of the biosphere including fauna and flora is called biota. The abiotic part is represented by three components: the lithosphere (solid part), the hydrosphere (liquid part), and the atmosphere.

Ex.1.21. Decide whether the following statements are true or false according to the text above. Argue them using the suggested phrases in the box.

Agreeing

That's quite right

That's true

Yes, I agree

I absolutely agree

I'm of exactly the same opinion

This is only partly true

As far as I know

Disagreeing

I don't agree

Not really

I disagree, I'm afraid

I don't think that's right

I can't agree

Surely not

On the contrary

It is absolutely wrong

1. Life emerged on the earth 50,000 years ago.
2. Farming completely changed the role of man in nature.
3. The most intelligent form of life on the planet is man.
4. Man is a special living being who can't be affected by the natural world.

5. Life on the planet can be found only on the earth's surface.
6. Nobody can live high in mountainous areas.
7. The biosphere includes all the living forms of the planet.
8. The biosphere consists of several components.

Ex.1.22. Put the words in correct order to make sentences.

- 1) emerged / Earth / on / ago / Life / about / 4 billion years.
- 2) on / the / form / planet / is / the / intelligent / Man / of / most / life.
- 3) the / includes / a great / life forms / on / of / The biosphere / number / planet.
- 4) between / the / Ecology / is / study / organisms / their / and / relationships / the / environment / of.
- 5) about / secure / began / 10,000 years ago / to make / to alter / Man / life / environment / and / his / comfortable.
- 6) caused / by / to deal with / ecology / problems / has / activities / Modern / human / environmental.
- 7) biology / as / Originally / ecology / treated / was / environmental.

Ex.1.23. Choose the best alternative to complete the following sentences.

1. The first emerged between 4 billion and 3.8 billion years ago.
a) animals b) living cells c) human beings
2. To make his life more secure and comfortable man began
a) to alter his environment b) to establish permanent settlements
c) to develop science
3. Man is the most ... form of life on the planet.
a) permanent b) intelligent c) special
4. Life on our planet ... in the biosphere.
a) emerges b) evolves c) exists
5. Man is ... upon the natural world.
a) sustainable b) responsible c) dependent
6. The biotic part of the biosphere consists of
a) flora and fauna b) the solid Earth c) the water
7. The biosphere is a ... layer around the Earth.
a) thick life-supporting b) thin life-supporting
c) non-living

Ex.1.24. Complete the sentences.

1. Man began to change
2. Man cannot ... , because he is a part of it.
3. Life on the planet exists
4. Only the hardest creatures can
5. The biosphere includes
6. The biosphere is
7. The system of energy use and material cycling runs on
8. The biotic part of the biosphere consists of

Ex.1.25. Find words and phrases that correspond to the definitions given below.

1. A thin layer which is the meeting place of land, air and water.
2. The envelope of air which surrounds the earth, consisting principally of a mixture of gases.
3. The solid crust of the Earth consisting of rocks and soils.
4. All the water of the earth in liquid and solid form.
5. The part of the biosphere consisting of living components (flora and fauna).
6. The part of the biosphere consisting of the lithosphere, the hydrosphere and the atmosphere.

Ex.1.26. Read the international words correctly. Mind the stress.

atmosphere	composition	industrialisation	portion
abiotic	distance	lithosphere	population
acceleration	energy	material	region
biosphere	fauna	metal	result
biotic	flora	nature	sort
comfortable	hydrosphere	natural	special
concept	idea	organism	structure
concentration	ignore	planet	system

Ex.1.27. Complete the following table using dictionary if necessary.

Verb	Noun	Adjective
	acceleration	
exist		

		special
originate		
	development	
establish		
	system	
invent		

Ex.1.28. Match English phrases with their Ukrainian equivalents.

- | | |
|-----------------------------|------------------------------------|
| 1) the first living cells | a) шар, що підтримує життя |
| 2) a part of nature | b) частина природи |
| 3) to give off energy | c) циклічність розвитку матерії |
| 4) material cycling | d) виділяти енергію |
| 5) population growth | e) змінювати навколишнє середовище |
| 6) to alter the environment | f) ріст населення |
| 7) a life-supporting layer | g) перші живі клітини |

Ex.1.29. Identify the meaning of the given words in the word combinations and sentences below.

Area: mountainous areas; densely settled areas; area under crop; residential area, areas of study.

Biota: biotic, abiotic. The biotic part of the biosphere consisting of fauna and flora is called biota. The abiotic part consists of the lithosphere, the hydrosphere and the atmosphere.

Create: living creature; a lovely creature. Only the hardest creatures can survive high in mountainous areas.

Contain: Some parts of the biosphere contain the highest concentration of living matter. Nowadays there are fewer products containing chlorofluorocarbons.

Environment: environmental; environmental protection; environmental studies; environmental research; social environment; natural environment; manmade environment; human environment; environmentalist. The problems of environmental protection are of great importance now.

Emerge: Emergency; in case of emergency; an emergency exit. This door is used only in case of emergency. The life on Earth emerged between 4 billion and 3.8 billion years ago.

Exist: Does life exist on Mars? Lime exists in many soils. Existence; in existence. Do you believe in the existence of life on other planets?

Layer: surface layer; water layer; the atmosphere is divided into layers; upper layers of the atmosphere; life-supporting layer.

Support: to support a family; to support life; to support air pressure; to give support to; to speak in support of; supporter.

Originate: origin; words of Latin origin, the origin of civilization; original; the original inhabitants.

Vary: to vary greatly; to vary from place to place. The highest concentration of living matter varies from a few metres in deserts and tundra to a hundred meters in tropical forest regions and oceans. The climate in this country is as varied as its landscape. Various: for various reasons; various types; at various times. Variety: variety of species; a life full of variety. Variation: variation of temperature, seasonal variations. Variable: variable winds, variable standards; variability. The most characteristic feature of Britain's weather is its variability.

Ex.1.30. Match the verbs in column A with a suitable phrase in column B.

A	B
1) to consist	a) by famous scientists
2) to make life	b) energy
3) to vary	c) into two parts
4) to include	d) of flora and fauna
5) to be developed	e) High in mountains
6) to give off	f) from a few meters to a hundred meters
7) to live	g) secure and comfortable
8) to divide	h) a great number of plants

Ex.1.31. Match the words in column A with their synonyms in column B.

A	B
1) environment	a) stratum
2) to develop	b) to appear
3) to contain	c) to work out
4) layer	d) idea
5) disastrous	e) to have in itself

- | | |
|----------------|-----------------|
| 6) to emerge | f) living thing |
| 7) creature | g) dangerous |
| 8) to discover | h) find out |
| 9) concept | i) surroundings |

Ex.1.32. Find the best explanation from a–g to the verbs 1–7.

- | | |
|-----------------|-------------------------------------|
| 1) to alter | a) to have smth. within itself |
| 2) to create | b) to appear; |
| 3) to contain | c) to have a specified beginning |
| 4) to exist | d) to make smth. new |
| 5) to emerge | e) to make different, to change |
| 6) to originate | f) to be, to continue living |
| 7) to divide | g) to separate into parts or groups |

Ex.1.33. Discuss in pairs:

- when the first living cells emerged;
- why man began to alter his surroundings;
- whether man is dependent upon the natural world;
- what the biosphere is;
- what biota is;
- what the biosphere runs on.

Ex.1.34. Complete the text using the words from the box.

emerge the solar system ape-like-men invented alter develop
 permanent settlements exists species
 has been around concept arrived

Planet Earth is 4,600 million years old

If we condense this inconceivable time-span into an understandable (1) ... , we can liken Earth to a person of 46 years old. Nothing is known about the first 7 years of his life, and whilst only scattered information (2) ... about the middle span, we know that only at the age of 42 the Earth began to (3) Dinosaurs and the great reptiles did not (4) ... until one year ago, when the planet was 45. Mammals ... (5) only 8 months ago; in the middle of last week manlike apes evolved into (6) ..., and at the weekend the last ice age enveloped the Earth.

Modern man (7) ... for 4 hours. During the last hour Man (8) ... agriculture. The industrial revolution began a minute ago.

When (9) ... appeared Man began to (10) ... his surroundings, making his life more comfortable.

He has multiplied the population to enormous numbers, caused the extinction of 500 (11) ... of animals, ransacked the planet for fuels and now stands like a cruel infant destroying this oasis of life in (12)

Ex.1.35. Complete the text with the prepositions from the box. There may be more than one possible answer.

in	for	to	of	on	nearby	among	with	around	without
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Kunas: the World's Greatest Conservationists

Sounds like a true fairy tale but the Kunas are a small tribe of only 30,000 people who live (1) ... a group of 360 islands, around Panama, in central America. They have been awarded the Global 500 prize which is given (2) ... those who are defenders of nature. The World Wildlife Fund (WWF), a famous organization engaged (3) ... the conservation of natural surroundings and other experts (4) ... the world have great respect (5) ... them.

Why do they deserve so much respect? Because they have succeeded (6) ... creating harmony between man and nature and also because their life is based (7) ... solidarity. They are considered to be the most democratic in all their thinking and actions.

The Kunas have great respect for the environment. The way in which they take care (8) ... nature is very simple but effective. They believe (9) ... conserving their forests. They use them but don't destroy them. They are very careful how they use water. They teach their children to respect nature. They have even fought people who wanted to build hotels and houses. Tourists are invited (10) ... the condition that they respect the natural surroundings.

The Kunas take decisions all together. Helping one another is a part (11) ... their tradition. For example, when a few young people wanted to cultivate some land, the whole village gave them a hand.

Moreover, the Kunas have good relationship (12) ... the other people living (13) This is because the only 'arm' they are equipped (14) ... is dialogue and exchanging ideas. In the past, other people tried to subject them but (15) ... success. The reason (16) ... this victory of the Kunas is their harmony (17) ... people which is the fundamental rule of life.

Ex.1.36. Translate the words and word combinations from Ukrainian into English.

З'являтися; довкілля; витривалі, міцні істоти; вид; частина природи; залежати від чогось; існувати; флора і фауна; жива матерія; поняття «біосфера»; використання енергії; тонкий шар, що підтримує життя.

Ex.1.37. Speak on the topics using the key words given below.

1. The impact of man on the environment.

(Farming, to settle down, to alter the environment, to make life secure and comfortable, industrialisation, towns and cities, population growth).

2. The biosphere is a life-supporting layer around the Earth.

(To exist, to include, to vary from ... to, to run on, energy use, material cycling, biota, abiotic, part, to divide, concept, originate, develop).

UNIT 2. FROM SPECIES TO ECOSYSTEMS

Key words

community – спільнота	pest – шкідник, паразит
biotic – біотичний, живий	parasite – паразит
abiotic – абіотичний, неживий	predator – хижак
interaction – взаємодія	to provide – забезпечувати
nitrogen – азот	movement – рух
soil – ґрунт	organic – органічний
photosynthesis – фотосинтез	biomass – біомаса
to capture – захватити	matter – матерія
biological control – біологічний контроль	to prey – полювати, ловити

Ex.2.1. Read the text and answer the questions.

1. What is an ecosystem?
2. How do the components of an ecosystem interact?
3. Which factors are ecosystems controlled by?

Ecosystem

Ecosystem is a community made up of living organisms and nonliving components such as air, water, and mineral soil. Ecosystems can be studied in two different ways. They are considered as interdependent groups of plants and animals, or as hierarchical systems and communities controlled by general rules. The living (biotic) and non-living (abiotic) components interact through nutrient cycles and energy flows. Ecosystems include interactions between organisms, and between organisms and their environment. Ecosystems can be of any size but each ecosystem has a specific, limited space. Some scientists consider the entire planet as one ecosystem.

Energy, water, nitrogen and soil minerals are essential abiotic components of an ecosystem. Ecosystem consumes the sun's energy and captures carbon dioxide from the atmosphere and uses them via photosynthesis to support the life in it. Animals are also important in the movement of matter and energy through ecosystems. They influence the amount of plant and microbial biomass that lives in