

Vocabulary & Definitions

Name [REDACTED]

Chapters or Units Covered: 1

**Instructions:** Your job is to be on the lookout for important words or terms that you will need to define for the test – words that members of the group need to notice and understand. Highlight these key words/terms, indicate the proper definition/explanation and then finally draw a diagram or relate this term to other key terms or concepts.

Word	Definition/Explanation	Draw a Figure/Relate to Other Terms
Ecology	The study of the factors that influence the distribution & abundance of organisms and the interactions between these factors.	
Distribution	Where organisms are found	
Abundance	How many organisms are found in a given area.	<p>Algae - Water/Land                      Plankton - Water                      Animals - Water/Land</p>
Biotic	Living factors	<p>Predators (dots) Competition (wavy lines) Food (apple, grapes) dispersal (arrow) Tree (mushroom)</p>
Abiotic	Nonliving factors	<p>N (North arrow) windspeed (wavy lines) direction (arrow) canopy cover (cloud) weather (cloud) High Elevation (mountain) Temp. °C (thermometer) Soil pH (arrow pointing down)</p>
Descriptive	Describes characteristics of populations & communities	<p>Tracks (dots)</p>
Functional	Relationships between variables	<p>snow cover compared to tracks</p>
Evolutionary	How did it get here over time?	<p>Fossils, Animals, Land Formation</p>

## Connections

Name: \_\_\_\_\_

Chapters or Units Covered: ch. 1

**Instructions:** Your job is to find connections between the content in your text book and notes. Go through the chapter in the textbook and look for specific examples or figures not used in lecture then ink these to what was discussed in lecture.

1) Robert Ross (1911) → described ~~Malaria~~ the propagation of malaria in mathematical terms. → described an ecological process

$$\begin{aligned} \text{(Rate of increase of infected humans)} &= \text{(New infections Per unit time)} - \text{(Recoveries Per unit time)} \\ &\quad \downarrow \quad \downarrow \\ &\quad \text{(depends on number of infected mosquitoes)} \\ \text{(Rate of increase of infected mosquitoes)} &= \text{(New infections Per unit time)} - \text{(Death of infected Per unit time)} \\ &\quad \downarrow \quad \downarrow \\ &\quad \text{(Depends on number of infected humans)} \end{aligned}$$

2) Ecology is focused on the natural world of animals and plants, and includes humans as a very significant species due to our impacts

→ Functional ecologists focus on proximate causes and ask How? Evolutionary ecologists focus on ultimate causes and ask why? ex. How does the system operate? Why does natural selection favor this particular ecological solution?

- scientist's dual role = carry out objective science and advocate for policies that attempt to change society (i.e. using more renewable energy sources) but keep these two separate.

3) The basic problem of ecology is to determine the causes of the distribution and abundance of organisms. → Therefore distribution & abundance are closely related.

- Ecology primarily deals with five levels of integration → Biosphere, Landscapes, Ecosystems, communities, Populations. Landscapes can be combined to include the whole-earth ecosystem, which is called the ecosphere or biosphere. Each level has different attributes & problems.

- plant and animal ecology are highly connected but developed along separate paths. connected due to the dependence of plants and animals on each other.

→ Descriptive ecology is the foundation of all ecological science and

mainly describes the vegetation groups of the world (like grasslands or deciduous forests) and the animals and plants and their interactions within each of these ecosystems.

- Precautionary principle → do no harm to the environment, take no action that is not reversible, and to avoid risk

## Specific Examples

Name: \_\_\_\_\_

Chapters or Units Covered: Chapter 2

**Instructions:** Your job is to identify specific examples from the chapter. Link up the example with key concepts and ideas that are throughout the chapter.

1) Evolution is the genetic adaptation of organisms to the Environment.

- Ecology and evolution are intricately connected because evolution operates through natural selection, which is ecology in action.
- Natural selection may act by directional selection, stabilizing selection, or disruptive selection
- Evolution results from directional selection, but for most ecological situations, stabilizing selection is most common.

2) - Fitness is a measure of the contribution of an individual to future generations and can also be called adaptive value.

- Selection 3 types: Genetic selection, Kin selection,  
Group selection pg ~~28~~ 28

3) Coevolution shapes the characteristics of co-evolving pairs of species, while ~~diffuse~~ diffuse coevolution might also occur in communities of many species.

~~ways~~ 4 mechanisms of change (1) Mutation (2) migration  
(3) Genetic Drift (4) Natural selection

4 factors for natural selection to occur:

- (1) They have the ability to replicate;
- (2) they produce an excess number of units above replacement needs
- (3) survival depends on some attribute (size, color, behavior)
- (4) a mechanism exists for the transmission of these attributes.

Turn Headings Into Questions

Name: \_\_\_\_\_

Chapters or Units Covered: 1

**Instructions:** Your job is to take each heading and subheading of the chapter and develop a critical thinking question for each heading. Try to go beyond the big picture and develop questions that require your group members to pay attention to specific details. Questions should require more than single word or sentence answers. Use the space below to write your questions and the corresponding answers.

Heading	Question	Answers
1) What is Evolution?	What is Evolution?	Evolution is change overtime & is the genetic adaptation of organisms to the environment
2) Adaptation	What are the three types of selection that can operate on phenotypic characters?	The three types are directional selection, stabourizing selection, and disruptive selection
3) Coevolution	What is Coevolution?	Coevolution is defined as occurs when a trait of species A has evolved in response to species B, which has evolved in response to the trait in species A.
4) Evolution & "Arms Race"	What does "Arms Race" mean in terms of biological evolution?	It means a reciprocal interaction between species meaning species A evolves better adaptations to exploit species B by evolving adaptations to improve species A.
5) Units of Selection	What are the three types of selection?	The three types of selection is Gametic, Kin, and group selection

### Short Answer Questions

Name \_\_\_\_\_

Chapters or Units Covered: \_\_\_\_\_

**Instructions:** Your job is to develop a list of questions that you think could be asked on a test. Try to go beyond the big picture and develop questions that require your group members to pay attention to specific details. Questions should require more than single word or sentence answers. Use the space below to write your questions and the corresponding answers.

Questions	Answers												
1) What is an example of a descriptive question?	How many tamaracks are on Paul Smith's college campus?												
2) <del>What</del> Identify and describe the concept that the early Greeks used regarding the balance of nature.	Providential ecology was the concept in which nature is designed to benefit and preserve each species. This concept also taught that the number of every species remained essentially constant.												
3) What are 3 abiotic + biotic factors that influence the distribution of organisms within an ecosystem?	<table style="border: none;"> <tr> <td style="vertical-align: top;"> <ol style="list-style-type: none"> <li>1) water availability</li> <li>2) temperature</li> <li>3) <del>amount</del> rainfall</li> </ol> </td> <td style="vertical-align: middle; padding-left: 10px;"> <table style="border: none;"> <tr> <td style="text-align: center;">Abiotic</td> <td style="text-align: center;">constant.</td> </tr> <tr> <td colspan="2" style="text-align: center;">Biotic</td> </tr> <tr> <td style="text-align: center;">1) competition</td> <td></td> </tr> <tr> <td style="text-align: center;">2) Disease</td> <td></td> </tr> <tr> <td style="text-align: center;">3) Predator/prey</td> <td></td> </tr> </table> </td> </tr> </table>	<ol style="list-style-type: none"> <li>1) water availability</li> <li>2) temperature</li> <li>3) <del>amount</del> rainfall</li> </ol>	<table style="border: none;"> <tr> <td style="text-align: center;">Abiotic</td> <td style="text-align: center;">constant.</td> </tr> <tr> <td colspan="2" style="text-align: center;">Biotic</td> </tr> <tr> <td style="text-align: center;">1) competition</td> <td></td> </tr> <tr> <td style="text-align: center;">2) Disease</td> <td></td> </tr> <tr> <td style="text-align: center;">3) Predator/prey</td> <td></td> </tr> </table>	Abiotic	constant.	Biotic		1) competition		2) Disease		3) Predator/prey	
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4) What are the 3 methods of approach to ecology and their benefits	<ol style="list-style-type: none"> <li>1) <u>Field</u> Benefit is that all observations are in their natural environment</li> <li>2) <u>Lab</u> Beneficial b/c you can control the variables.</li> <li>3) <u>Theoretical Modeling</u> - data analysis</li> </ol>												
5) How has ecology changed over time?	In primitive times of ecology, people were only <del>just</del> interested in food. Then, people began to manipulate the land for food. The next idea was that nature is balanced and designed to benefit and preserve. Finally, in the late 18th and early 19th century fossils were found and proved that <del>some</del> certain species had gone extinct. This resulted in the understanding of the <del>process</del> process of natural selection.												

## Summary

Name: \_\_\_\_\_

Chapters and Units Covered: 4

Instructions: Your job is to prepare a summary of the chapter focusing on the most important ideas..

### Summary:

A transplant experiment determines whether the limitation on distribution results from the inaccessibility of the particular area to the species. We move species to another group of area to see if they can reproduce and survive successfully. Physiological Ecology is to determine the tolerances of organisms to a range of environmental factors. The tolerance of species can change via the process natural selection. We are led to investigate the genetic variation within populations to look for range extensions or contractions that are associated with evolutionary shifts in the adaptations of organisms to their environment.

Key Idea: Liebig's Law of the Minimum- The rate of any biological process is limited by that factor, in least amount relative to requirements

Key Idea: Shelford's Law of Tolerance- The geographical distribution of a species will be controlled by that environmental factor for which organism has narrowest range of tolerance

Key Idea: Transplant experiments can help to identify the potential range of a species- genetic or environmental

Key Idea: The tolerance ranges of a species can change via natural selection.

Key Idea: All species have a limited geographic range, and the task is to discover what causes these limits

## Population Modeling and Equations

Name: \_\_\_\_\_

Chapter: \_\_\_\_\_

**Instructions:** Your job is to identify 1 equation from lecture (when applicable). First write out the equation and any important side notes you have (density dependent, overlapping generations, etc.). Next, put the equation into words that make sense (“English”). Then, label each part of the equation. Now make up your own example question that can be answered using the equation, and solve for the answer; be sure to show all your work.

Equation	What This Equations Means in “English”	Label Each Part of The Equation
$N_t = N_0 e^{rt}$	Predict exponential growth of a population with overlapping generations	$N_t$ population at time t $N_0$ starting population e base of the natural log r intrinsic rate of increase t time into the future
Example Question	Work and Steps to Solving Problem	
If we start with a population of 10 individuals with an intrinsic rate of increase of 0.2 what is the predicted population size after 6 years?	1. Identify the variables $N_0 = 10$ $r = 0.2$ $t = 6$  2. Plug variables in and calculate $N_6 = 10e^{0.2 \cdot 6}$ $N_6 = 33.2$	