

## 1.1 Ecology Is the Study of the Relationship between Organisms and Their Environment

- “Ecology is the study of all of those complex interrelationships referred to by Darwin as the conditions of the struggle for existence.” (Haeckel)
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## 1.2 Organisms Interact with the Environment in the Context of the Ecosystem

- Physical and chemical conditions include:
  - temperature
  - moisture
  - concentration of gases (O<sub>2</sub> and CO<sub>2</sub>)
  - light intensity
  - Interactions with other organisms include:
    - mating
    - predator and prey
- What is the environment in which an organism lives?
  - It is a place
  - a physical location in time and space
    - can be large or small
    - can be aquatic or terrestrial
    - can be stable or transient
- Includes physical and chemical conditions and other organisms
- An ecosystem is a collection of parts that function as a unit
  - biotic – living components
  - abiotic – nonliving (physical and chemical) components

Example: A forest is an ecosystem

- What are the abiotic components?
  - What are the biotic components?
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## 1.3 Ecological Systems Form a Hierarchy

- List the hierarchy here and where your organism is found.
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## 1.4 Ecologists Study Pattern and Process at Many Levels

At each level in the ecosystem hierarchy, different patterns and processes emerge. In order to study these different levels, different approaches may be needed

- What are some of the subdisciplines in Ecology?

The effects of birth and death can be studied at multiple levels

- Individual – birth and death are discrete events and happen only once
- Population – birth and death are continuous
  - measured as rates, such as births/year
- Community – focus shifts to relative abundance of species within the community
  - How do interactions among species affect birth and death rates?
- Ecosystem – emphasis shifts from species to the flows of energy and nutrients through both biotic and abiotic components of the ecosystem. Includes questions such as:
  - At what rate are energy and nutrients converted into biomass, including new individuals?
  - At what rate are energy and nutrients in organisms broken down, including decomposition after death?
- Landscape – a patchwork of ecosystems in which spatial patterns are important
  - How are energy and nutrients exchanged between ecosystems?
- Global scale – focus on the distribution of different types of ecosystems or biomes
  - How do patterns of biological diversity vary in different biomes?
- Biosphere – emphasis on the linkages between ecosystems and other components of Earth, such as the atmosphere
  - How are nutrients such as carbon exchanged between the atmosphere and terrestrial ecosystems?

Subdisciplines in ecology are organized based on these different levels to identifying linkages to other levels is an important goal

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## 1.8 Ecology Has Strong Ties to Other Disciplines

- What are some of the physical and chemical (abiotic) parts of the environment?
- How do ecologists gain information on these?
- Ecologists must draw on information from other sciences
  - Geology
  - Hydrology
  - Meteorology
- For example:
  - plants take up water, influencing soil moisture and surface water flow
  - plants lose water to the atmosphere, increasing water vapor and influencing precipitation
  - the geology of an area influences the available water and nutrients that plants need
- Today, many ecologists are studying the dominant role that humans are playing in earth's ecosystems
- There are four main areas of impact:
  - human population growth
  - biological diversity
  - sustainability
  - global climate change
- Environmental Science
  - The environmental problems caused by humans are ecological problems

- o Ecology allows us to understand the causes and identify ways to lessen their impacts
  - **Environmental science** provides a broader, interdisciplinary approach that includes social, political and ethical dimensions to these problems
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## 1.9 The Individual Is the Basic Unit of Ecology

- What is an individual?
  - Why is the individual the basic unit of ecology?
  - The individual organism senses and responds to its environment
  - The individual reproduces, passing its genetic information to future individuals that will be part of future populations, communities, and ecosystems
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## CFU

1. What is Ecology? Why is it important to study?
  2. How do organisms interact with their environment?
  3. What is an Ecosystem? Are they all the same and why?
  4. What is a Hierarchy? Where do you fit into the hierarchy?
  5. The world pop is >7.5 billion. At what rate is the population increasing? Is the rate the same all over the world?
  6. Professor Arias is a conservation biologist (type of ecologist). How can I work with another ecologist to help a species like the sturgeons found in the Delaware River?
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## Evolution

Overproduction	Most species produce more offspring than can survive.
Competition	Since living space and food are limited, organisms must compete for the necessities.
Variation	Differences between individuals in a population.
Adaptations	Any kind of inherited trait that improves an organism's chances of survival.
Natural selection	The environment selects organisms with optimal traits to be the parents of the next generation.
Speciation	Over many generations, favorable adaptations accumulate and may result in a new species.

## Assignment

The best way to learn anything is to apply it to real concepts.

1. Choose an animal (no dog/cat/parakeet/snake...etc.,). look for what is categorized as a Keystone Species.
2. Use the lecture notes to outline the information you have found on your organism.

Example:

- Physical and chemical conditions include:
  - o Temperature: *The Anguilla rostrata* can tolerate a wide range of temperatures between 4 and 25°C (Baensch and Riehl 1995, Hill 1969, Sheldon 1974).
  - o moisture: *The Anguilla rostrata* is a fish and lives in aquatic environments. It can traverse lands for up to three days in search for other bodies of water (needs citation).
  - o concentration of gases (O<sub>2</sub> and CO<sub>2</sub>)
  - o light intensity
  - o Interactions with other organisms include:
    - o mating
    - o predator and prey