

“Organisms are open systems that interact continuously with their environments...”

- ❑ **Ecology** is the scientific study of the interactions between organisms and their environment.
The interactions between organisms and their environments determine the distribution and abundance of organisms
- ❑ Ecologists make predictions of what should be observed in the environment.
- ❑ The environment of any organism includes the following components:
 - ❑ **Abiotic** factors: non-living chemical and physical factors such as temperature, light, water, wind, rocks, soil, and nutrients
 - ❑ **Biotic** factors: the living components**Ecological research ranges from the adaptations of individual organisms to the dynamics of the biosphere**
- ❑ **Organismal ecology** is concerned with the behavioral, physiological, and morphological ways individuals interact with the environment.
- ❑ **Population:** a population is a group of individuals of the same species living in a particular geographic area.
 - ❑ Population ecology examines factors that affect population size and composition.
- ❑ **Community:**
 a community consists of all the organisms of all the species that inhabit a particular area.
 - ❑ **Community ecology** examines the interactions between populations, and how factors such as predation, competition, and disease affect community structure and organization.
- ❑ **Ecosystem:** an ecosystem consists of all the abiotic factors in addition to the entire community of species that exist in a certain area.
 - ❑ **Ecosystem ecology** examines the energy flow and cycling of chemicals among the various abiotic and biotic components.
- ❑ **Landscape ecology** deals with the array of ecosystems and their arrangement in a geographic region.
 - ❑ A **landscape** or **seascape** consists of *several different ecosystems* linked by exchanges of energy, materials, and organisms.

Factors Affecting the Distribution of Organisms

- ❑ Ecologists have long recognized distinct global and regional patterns in the distribution of organisms.
- ❑ **Biogeography** is the study of past and present distributions of individual species, which provides a good starting point to understanding what limits geographic distributions.
 - ❑ Ecologists ask a series of questions to determine what limits the geographical distribution of any species.

Species dispersal, behavior, and habitat selection contributes to the distribution of organisms

- ❑ Species transplants.
 - ❑ One way to determine if **dispersal** is a factor in limiting distribution is to analyze the results when humans have accidentally or intentionally transplanted a species to areas where it was previously absent.
 - ❑ If the transplant was successful, then the *potential* range of the species is larger than the *actual* range.
 - ❑ If the transplant was unsuccessful, then distribution is limited by other species or abiotic factors.
- ❑ Problems with Introduced Species.
 - ❑ Transplanted species often explode to occupy an new area.
 - ❑ Sometimes organisms do not occupy all of their potential range, but select particular habitats.

Biotic factors affect the distribution of organisms

- ❑ Predator removal experiments can show how predators limit distribution of prey species.

Abiotic factors affect the distribution of organisms

- ❑ Temperature: some organisms can only tolerate specific ranges of temperature.
 - ❑ Water: some organisms can only tolerate either fresh or salt water.
- ❑ Sunlight provides energy that drives nearly all ecosystems.
 - ❑ The intensity and quality of light, and photoperiod can be important to the development and behavior of many organisms.
- ❑ Wind amplifies the effects of temperature by increasing heat and water loss (wind-chill factor).
- ❑ Rocks and soil: the physical structure and mineral composition of soils and rocks limit distribution of plants and the animals that feed upon them.

Temperature and water are the major climatic factors determining distribution of organisms

- ❑ **Climate** is the prevailing weather conditions in an area.
 - ❑ Temperature, water, light, and wind are major components of climate.
- ❑ **Climate and biomes.**
- ❑ Climate determines the makeup of **biomes**, the major types of ecosystems.
- ❑ Annual means for temperature and rainfall are reasonably well correlated with the biomes we find in different regions.
- ❑ **Global climate patterns.**
 - ❑ These are largely determined by sunlight and the planet's movement in space.

 - ❑ The angle of the earth's axis is responsible for seasonal variations on the earth.
- ❑ **Local and seasonal effects on climate.**
 - ❑ Bodies of water and topographic features such as mountain ranges can affect local climates.
 - ❑ Ocean currents can influence climate in coastal areas.
 - ❑ Mountains affect rainfall greatly.
- ❑ Ponds and lakes are sensitive to seasonal temperature change.
 - ❑ Turnover brings oxygenated water from the surface of lakes to the bottom and nutrient-rich water to the top.
 - ❑ **Microclimate – climate variations on a very fine scale.**
 - ❑ Scientists can refer to microclimate on a forest floor or under a rock.
 - ❑ **Long-term climate change.**
 - ❑ Climate changes can have long-term effects on the biosphere.
 - ❑ Global warming may affect distribution of organisms.
 - ❑ The ice ages affected distribution in the past.