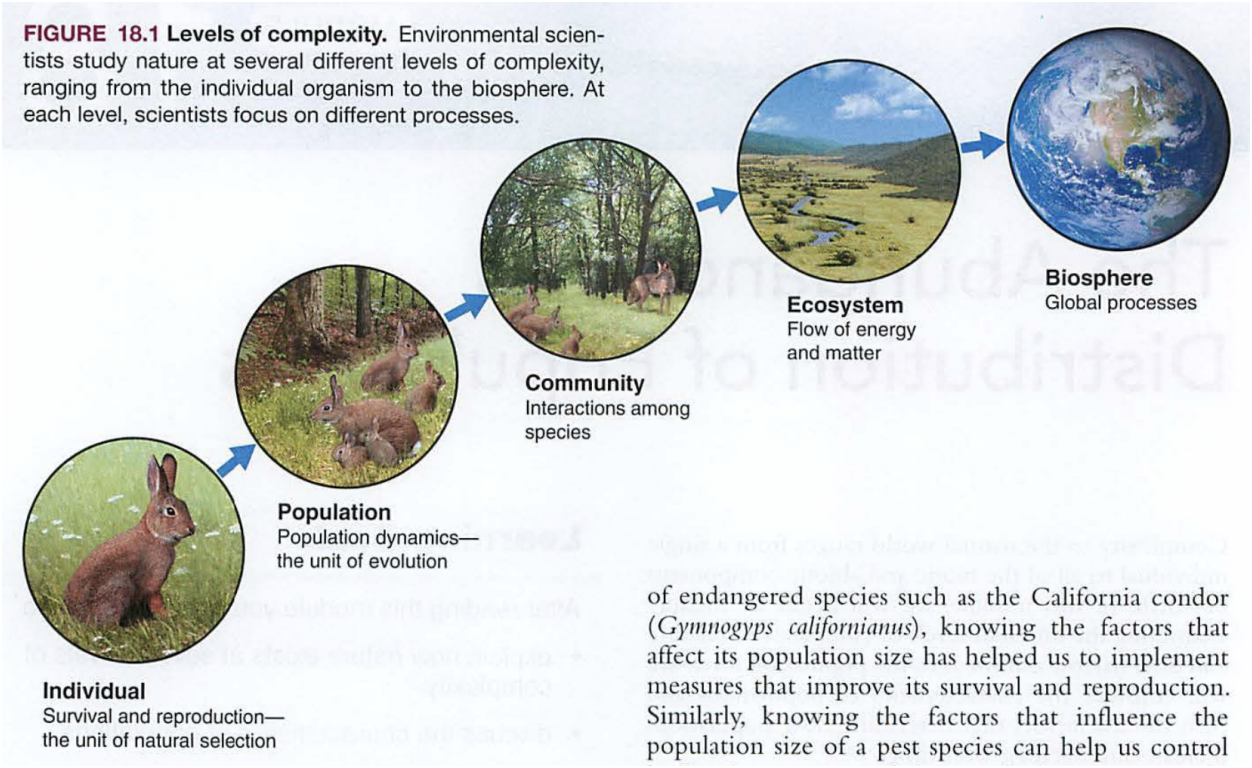
Module 18: Population distribution

Module 18-abundance and distribution

Start with this:



Screenshot 2024-11-12 at 5.33.08 PM.png

A crude example of this might be:

- individual-you
- population-HPA
- students community-HPA
- ecosystem-education
- biosphere-the world

or:

- some rabbit individual
- some of the rabbit's friends,
- a population of rabbits
- rabbits and the things they eat and eat them-community
- ecosystem-the plants that support both ends of this process
- biosphere-the planet

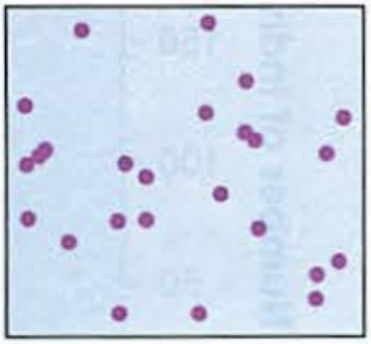
We covered ecosystem energy and matter a few weeks ago, this chapter is about population ecology.

Population dynamics

Notation:

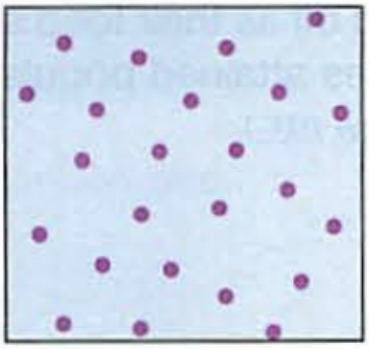
- Population size is represented as N (note not "n"): population size within a defined area at a specific time (brings in migration).
- So, we could say the student population of HPA would be all students **here** this year, **2024-2025**
- Check out the diagrams on population distribution: random, uniform and clumped. Important vis a vis biodiversityStructures: age and gender (sex)





(a) Random distribution





(b) Uniform distribution





(c) Clumped distribution

Screenshot 2024-11-12 at 5.39.41 PM.png

- **Density dependent factor:** e.g. food or reproductive rate in rats (more rats, lower "fecundity" or birthrate)
- Something that influences reproduction or survival...
- **Density independent factors:** storms, disasters, fires (note density independent: one bambi or 100 bambi all perish in the same fire)
- **Limiting resource:** usually food, but could include space, nutrients, etc.
- **Carrying capacity:** K (note not "k"): how many individuals an environment can support

---

Carrying capacity is the maximum number of individuals of a species that an environment can sustainably support over time, given the available resources such as food, water, shelter, and other necessities. The concept of carrying capacity is central to ecology and population biology, as it helps determine the limits of population growth in an ecosystem.

Key Factors Influencing Carrying Capacity

1. **Availability of Resources:** The amount of food, water, and shelter determines the carrying capacity. If resources are abundant, the carrying capacity is higher. If resources are limited, the carrying capacity is lower.
2. **Environmental Conditions**: Factors like climate, temperature, and natural disasters influence carrying capacity. For example, harsh winters or droughts can reduce the carrying capacity for a species in a given area.
3. **Species Interactions**: Predation, competition, and symbiosis all affect carrying capacity. High predation rates or competition for resources among species can reduce the carrying capacity for each population.
4. **Waste Accumulation and Pollution**: The buildup of waste or pollution in an ecosystem can lower the carrying capacity by degrading the environment and reducing resources available for organisms.

How Carrying Capacity Works

- **Population Growth Phases**: When a population starts in a new environment with abundant resources, it typically grows rapidly (exponential growth). However, as the population size approaches the carrying capacity, resources become scarcer, leading to competition and slower growth (logistic growth).
- **Equilibrium**: Eventually, the population stabilizes around the carrying capacity, where birth and death rates are in balance. This means that, on average, the number of individuals added to the population is equal to the number that die.

- **Overshoot and Dieback**: If a population temporarily exceeds its carrying capacity due to a sudden resource boost or reduced predation, it may experience a “population overshoot.” This often leads to resource depletion, after which the population undergoes a dieback (sharp decline) to below the carrying capacity.

Examples of Carrying Capacity

- **Deer in a Forest**: In a forest ecosystem, the carrying capacity for deer depends on available food, space, and water. If deer numbers exceed the carrying capacity, the forest may become overgrazed, reducing food availability. This leads to higher competition, malnutrition, and potentially increased death rates until the population returns to a sustainable level.
- **Fish in a Pond**: In a pond, the carrying capacity for fish is limited by factors like water oxygen levels, food supply, and space. Overcrowding can reduce oxygen and increase waste, causing a decrease in the fish population until it stabilizes at a level the pond can support.

Importance of Understanding Carrying Capacity

- **Conservation and Wildlife Management**: Understanding carrying capacity allows conservationists to manage wildlife populations, ensuring that species do not exceed the limits of their environment, which could harm the ecosystem.
- **Human Population**: Carrying capacity applies to human populations as well. Overpopulation can lead to resource depletion, pollution, and habitat destruction, making it essential to manage resources and plan sustainably.

Key Takeaways

- **Carrying capacity** is the maximum sustainable population size an environment can support over time, given its resources.
- **Resource limitations** and **environmental conditions** primarily determine carrying capacity, which stabilizes populations over time.
- **Exceeding carrying capacity** can lead to a population decline, as the environment becomes unable to support the population due to resource depletion or environmental degradation.

Migrated from Apple Server Wiki. Original page ID: u7c773X3

Revision #2
Created 2026-09-29 15:58:52 UTC by Admin
Updated 2026-09-29 16:20:48 UTC by Admin