



EQ: How does population size affect an ecosystem?



The term "population" refers to all the members of *one* species, in one place at one time.



How many populations?

There are three general terms used to describe populations:

Population size- the number of individuals in a population

Population density- the number of individuals in a given area

Dispersion- the way individuals are arranged in space



Dispersion- How members of a population are arranged in a given space.

What can dispersion tell us about a population?

Reproduction

Protection (from predators)

Hunting Patterns



Individuals in a population may be distributed according to 3 basic patterns of dispersion

- Random
- Uniform (aka Even)
- Clumped



Random Dispersion- Scattered, not uniform. Why?

- -Environment is uniform
- -Individuals are solitary
- (They live independently).



Pine trees in a random distribution

Uniform Dispersion- About equal distance apart, forming a pattern.

Why?

Resource competition



Clumped Dispersion- Grouped in some places, absent in others. Why?

- Resources are patchy
- Search for food



Population Density- The number of individuals in a population that live within a *given* area.

Scientists study density to help determine how the individuals interact.

- Reproduction
- Protection
- Eating patterns
- Social hierarchies, if any



Which population of wildebeest has the greatest population density?



Population Growth

Natural populations tend to stay the same size year after year. But they can suddenly increase or decrease.

Factors that affect population size:

- Number of births
- Number of deaths
- Number of individuals that enter or leave the population
 - Immigration: movement of individuals into a population
 - Emigration: movement of individuals out of a population

Many animals move when they reach maturity to find new territory, mates, and/or food.



Modeling Population growth

Population success = reproduction of species

We can study how and why the number of individuals change over time.

Growth rate of a population (r)

(r) = birthrate - death rate

If a population is given abundant resources, protection from predators and disease, then it will thrive.

There are two types of population growth: Exponential Growth Logistic Growth

Exponential Growth

Exponential growththe rate of population growth stays the same and the population size increases steadily.

This model displays a J-shaped curve which indicates a steady increase of population size.



What if the population size kept growing and growing?

carrying capacity (K)- the population size that an environment can sustain

What factors do you think contribute to an environment's carrying capacity???



Overpopulation can lead to

- Insufficient supply of water
- Starvation and malnutrition or poor diet
- Unhygienic living conditions.
- Higher risk for infectious disease
- Disturbance of ecosystems

Density Dependent Factors-

Resources that are limited because the rate at which they become depleted depends on the density of the population that uses them.

Examples:

Food Water Shelter



Can limit the population size!



Logistic Growth

This model of population growth considers the carrying capacity (K) and is limited by density-dependent factors.

As resources become less available, the growth of a population slows or stops. This forms an S-shaped curve.

Population size capped at carrying capacity.



The growth of population of Paramecium caudatum

Limiting Factors

A limiting factor is something that causes population growth to decrease.



Density Independent Factors-

Factors that do not depend on the size of the population, but can affect it nonetheless.

Examples

Weather Climate



Can reduce a population size, but it is completely random and does not consider how dense the population is. Left Side

Exponential versus logistic population growth



• Draw the curves and explain why exponential growth is not feasible?



• Draw and explain the different types of dispersion.