



Population Ecology

Chapter 5



Describing Populations

Ecologists study populations by examining:

(Leave room to add notes under each)

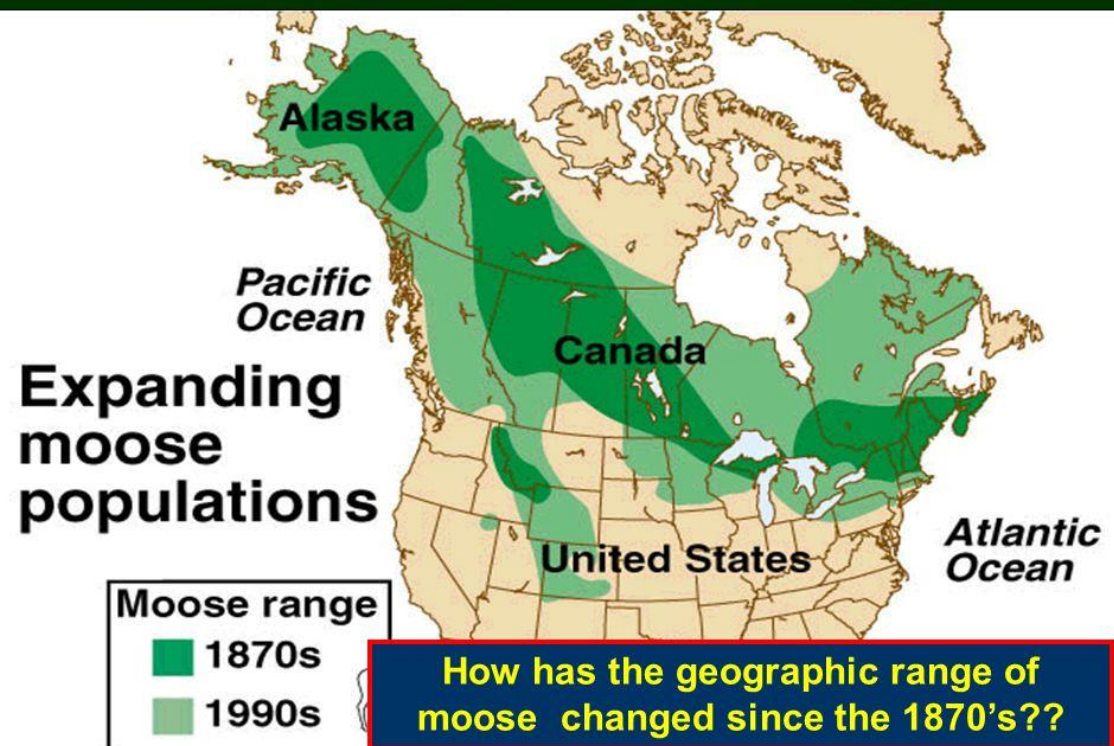
- *geographic range*-place a population lives
- *growth rate*- how quickly population increases or decreases
- *density*-number of individuals in an area
- *distribution*-how individuals are spaced out
- *age structure*-describes ages and genders of population

Population Dynamics

Geographic Ranges


- The range of a species depends on biotic and abiotic conditions found in the area.

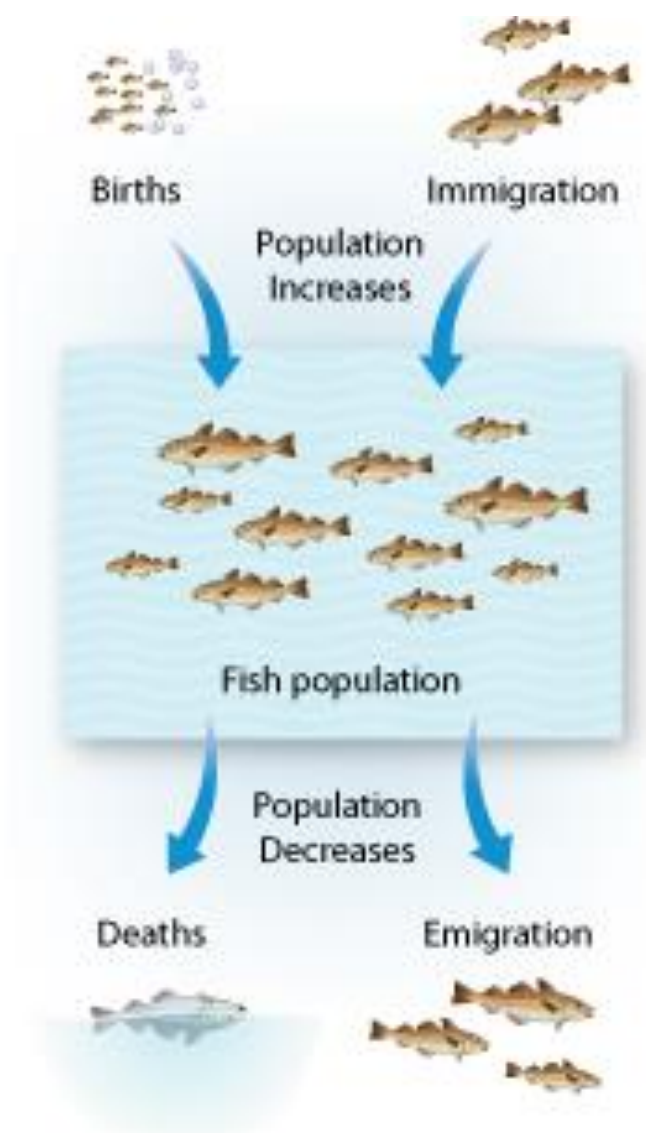
Range Changes in Moose Populations



Population Dynamics

Population Growth Rate

- The **population growth rate** (PGR) explains how fast a given population grows. 
- Birthrate (natality), death rate, immigration and emigration affect PGR



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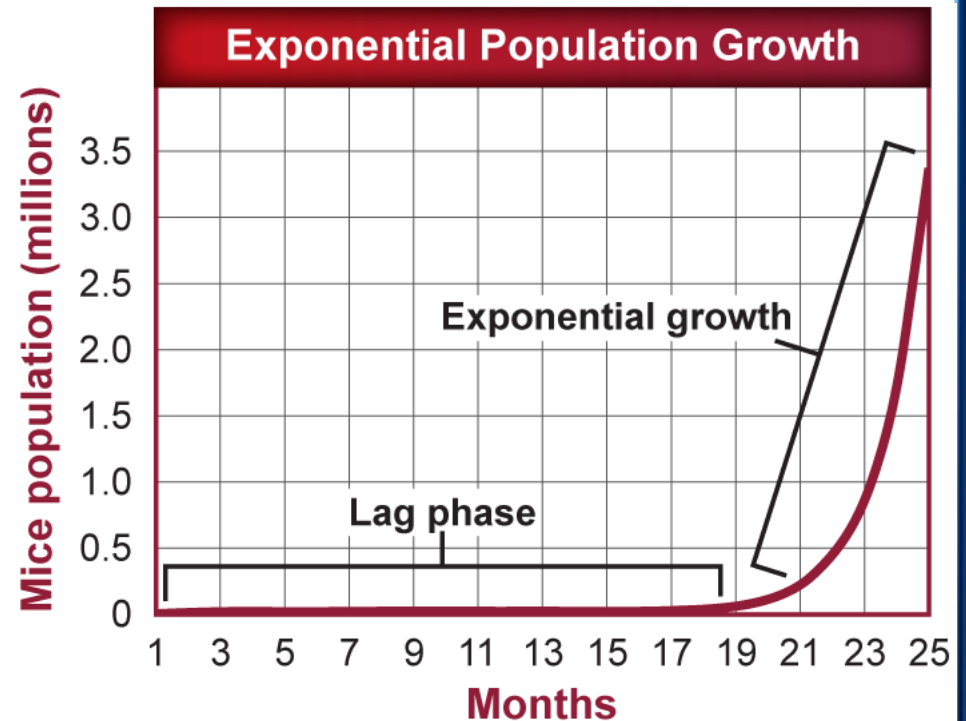
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Population Dynamics

Exponential Growth Model

- Exponential growth occurs when the resources are unlimited.
- J shaped curve
- All populations grow exponentially until some limiting factor slows the population's growth.

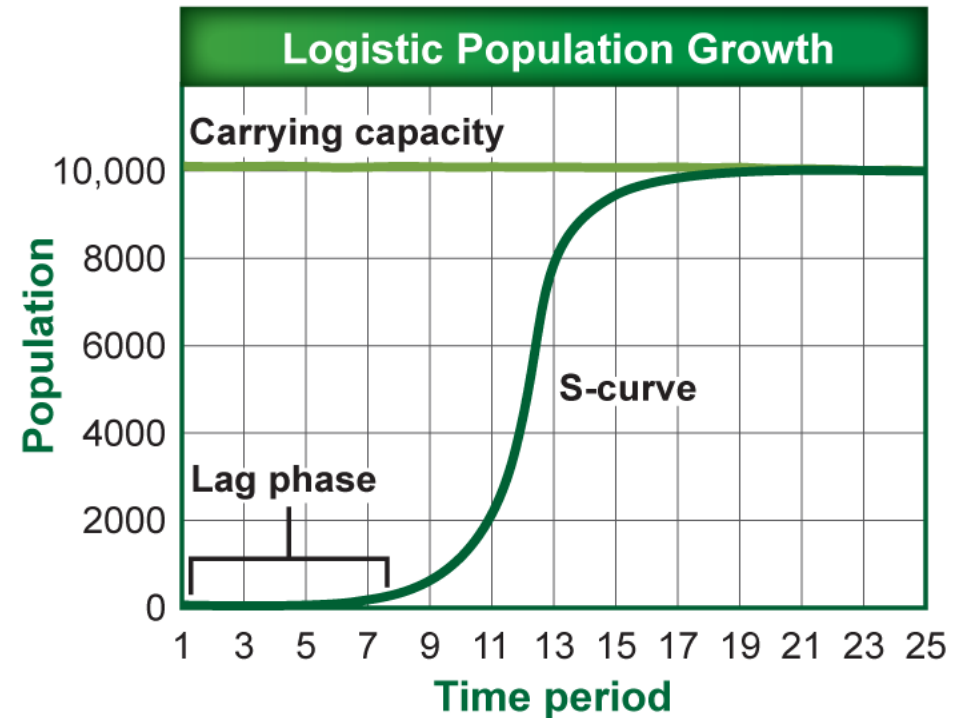


What is happening during the lag phase?

Population Dynamics


Logistic Growth Model

- The population's growth slows or stops following exponential growth, at the population's carrying capacity.
- Curve is S shaped



Population Dynamics

Carrying Capacity

- The maximum number of individuals in a species that an environment can support for the long term is the **carrying capacity**. 
- Carrying capacity is limited by the energy, water, oxygen, and nutrients available.

Population Dynamics

- The rate strategy, or *r*-strategy, is an adaptation for living in an environment where fluctuation in biotic or abiotic factors occur.
- An *r*-strategist is generally a small organism.
- Short life span
- Produces many offspring

ADD: r/k strategist chart to EOC NB

	<i>r</i> Unstable environment, density independent	<i>K</i> Stable environment, density dependent interactions
Organism size	Small	Large
Energy used to make each individual	Low	High
# Offspring produced	Many	Few
Timing of maturation	Early	Late (with much parental care)
Life expectancy	Short	Long
Lifetime reproductive events	One	More than one
Survivorship curve	Type III	Type I or II

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[Resources](#)

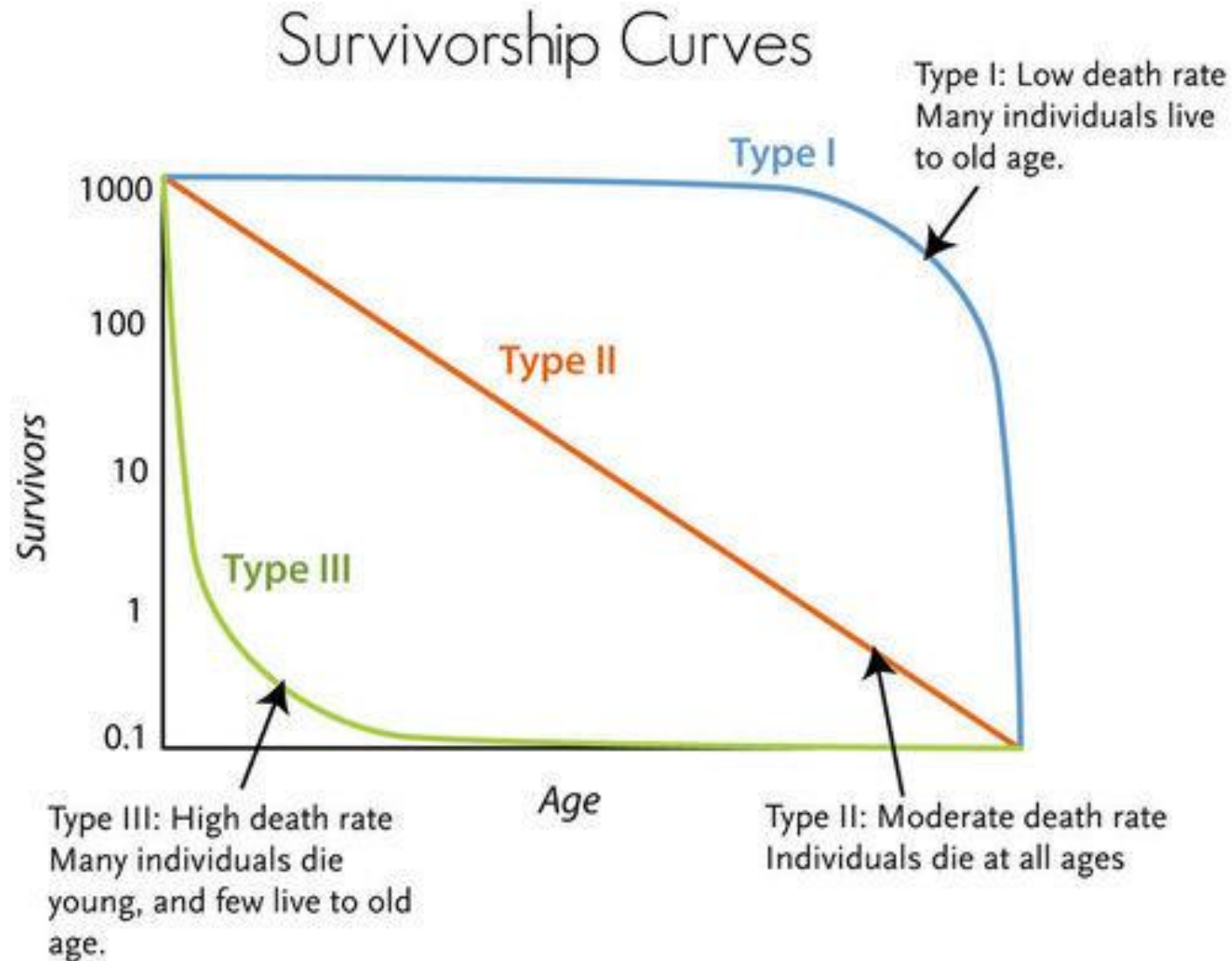

Population Dynamics

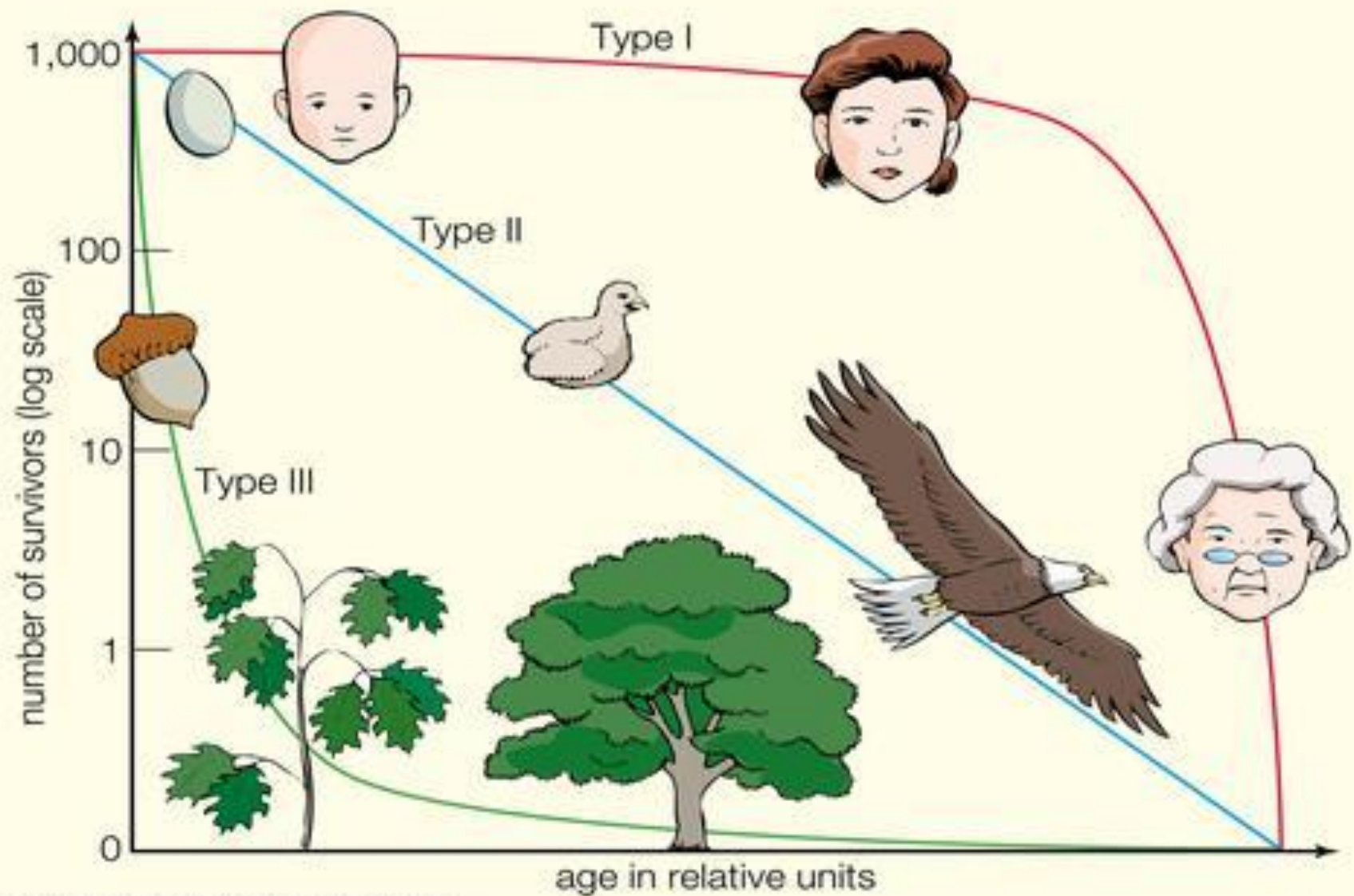
- The carrying-capacity strategy, or *k*-strategy, is an adaptation for living in stable environments.
- A *k*-strategist is generally a larger organism.
- Long life span
- Produces few offspring

Population Dynamics

- A population stops increasing when the number of births is less than the number of deaths or when emigration exceeds immigration.

Survivorship Curves





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Population Dynamics

Population Density

- The number of organisms per unit area

Population Distribution

- **Dispersion** is the pattern of spacing of a population:
 - Random-individuals space unevenly
 - Uniform-individuals spaced evenly
 - Clumped-individuals are grouped together


Section 2: Population Dynamics

Population-Limiting Factors

- There are two categories of limiting factors—density-independent factors and density-dependent factors.


Population Dynamics

Density-Independent Factors

- Any factor in the environment that does not depend on the number of members in a population per unit area is a **density-independent factor**. 
- Weather events
- Fire
- Human alterations of the landscape
- Air, land, and water pollution

Population Dynamics

Density-Dependent Factors

- Any factor in the environment that depends on the number of members in a population per unit area is a **density-dependent factor**. 
- Biotic factors
- Disease
- Competition
- Parasites

The Wolves of Isle Royale, see TB pg 154 Videoclip




[Home](#)

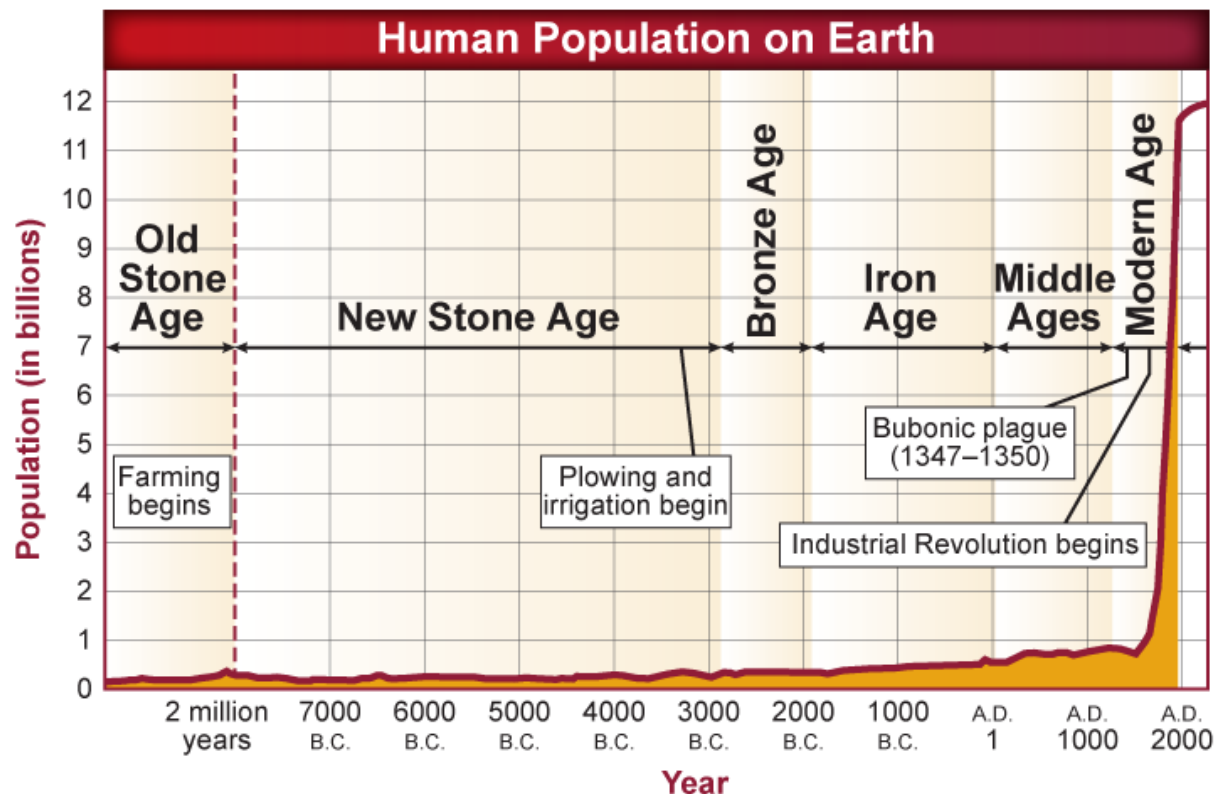
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Human Population

Human Population Growth

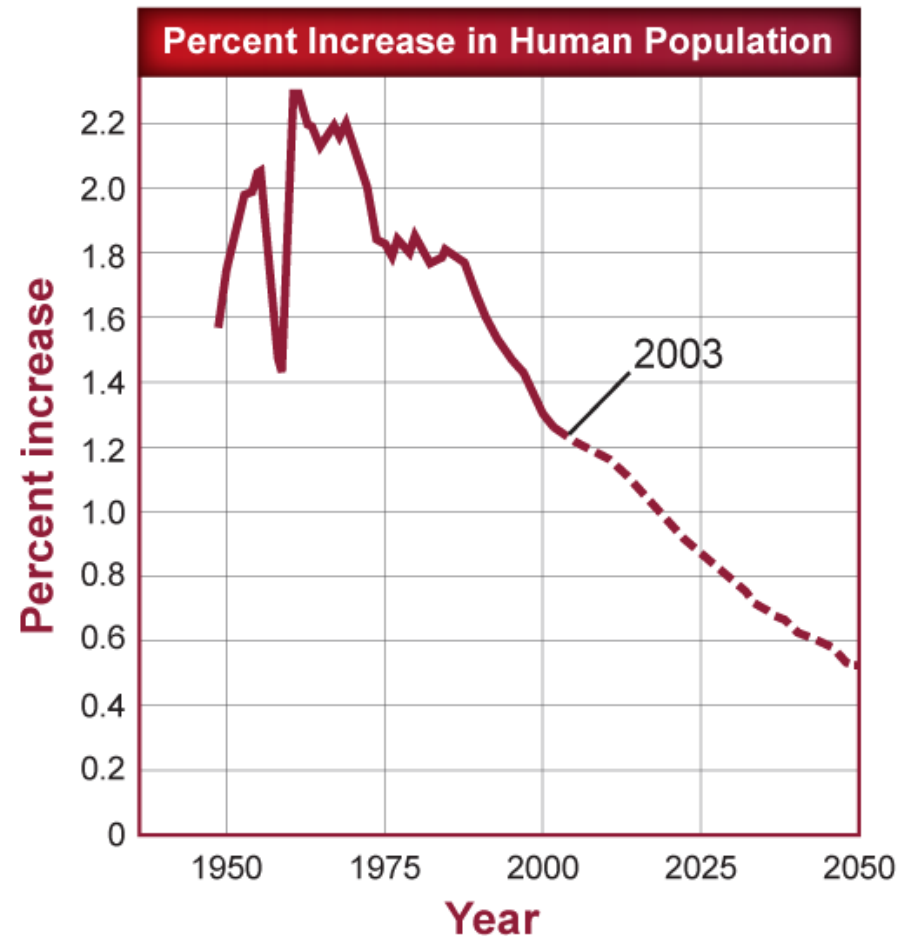
- The study of human population size, density, distribution, movement, and birth and death rates is **demography**. 



Human Population

Human Population Growth Rate

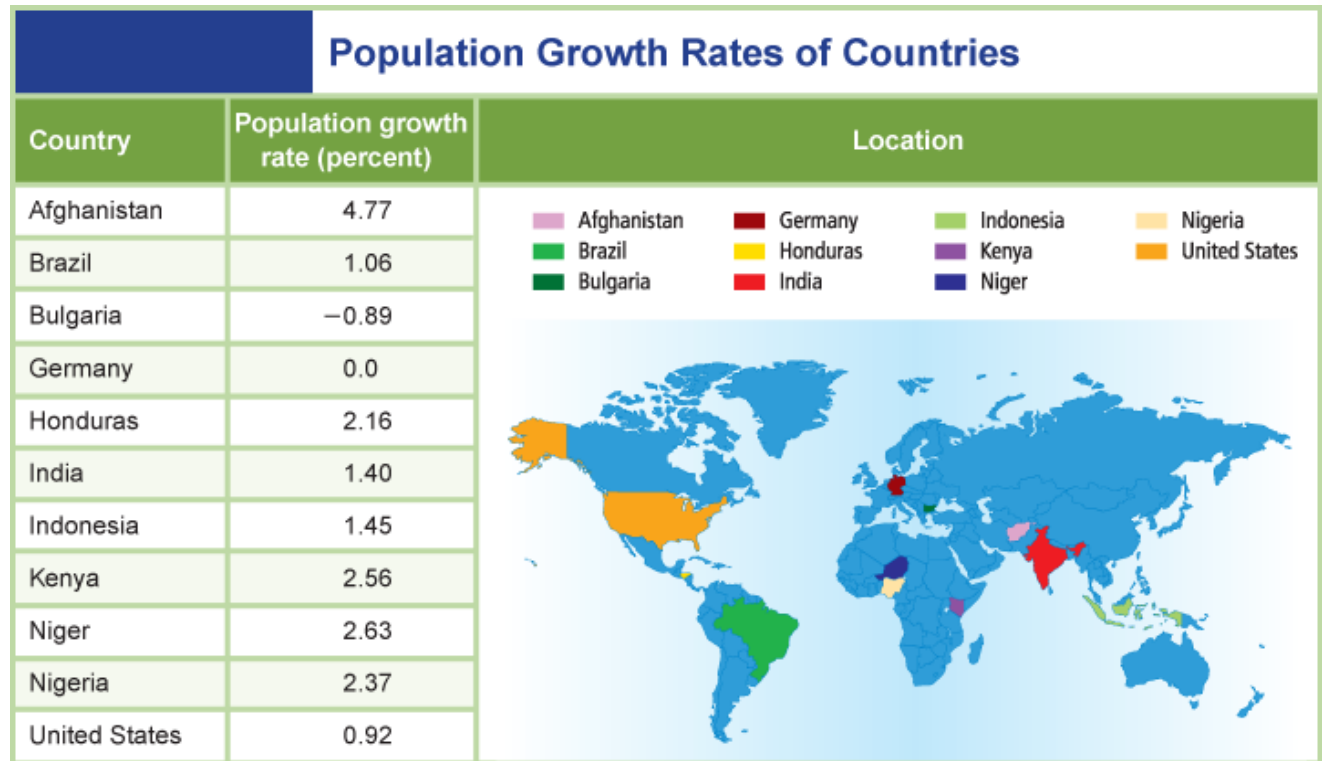
- Although the human population is still growing, the rate of its growth has slowed.



Human Population


Trends in Human Population Growth

- Population trends can be altered by events such as disease and war.
- Human population growth is not the same in all countries.



Human Population

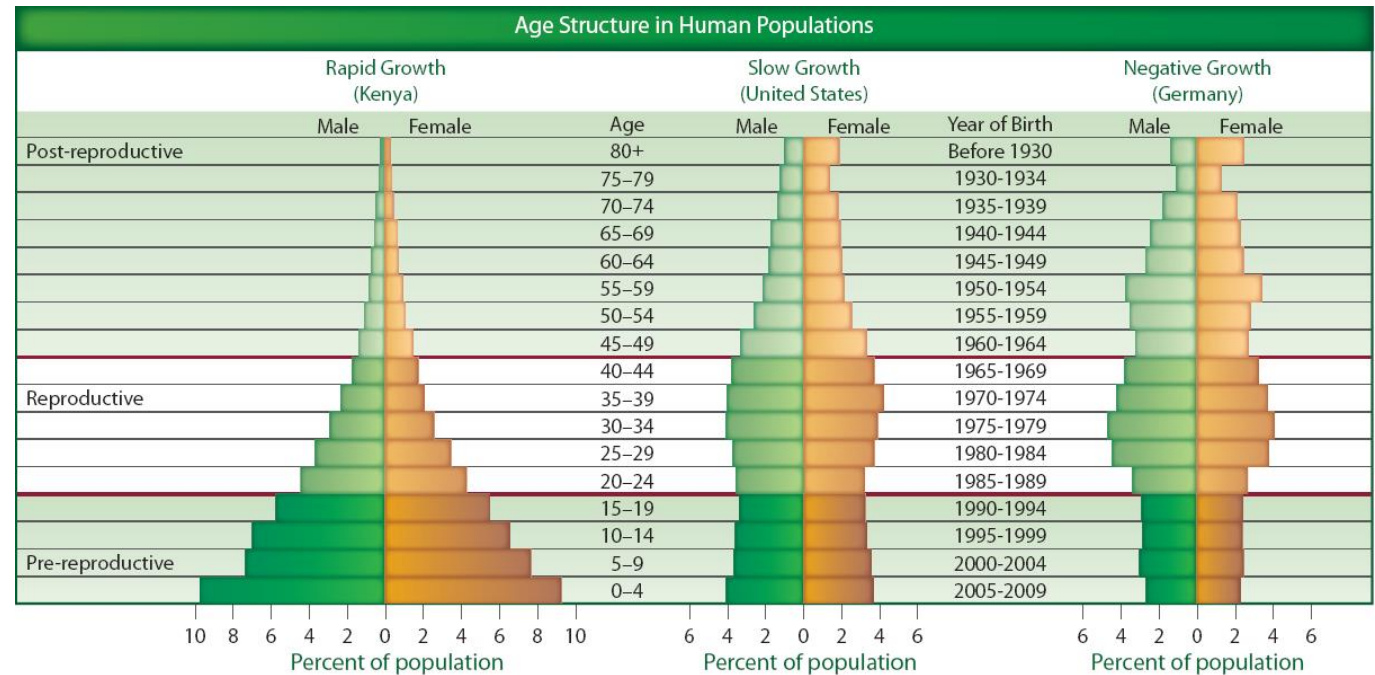
Zero Population Growth

- **Zero population growth** (ZPG) occurs when the birthrate equals the death rate. 
- The age structure eventually should be more balanced with numbers at pre-reproductive, reproductive, and post-reproductive ages being approximately equal.

Human Population

Age Structure

- A population's **age structure** is the number of males and females in each of three age groups: pre-reproductive stage, reproductive stage, and post-reproductive stage.

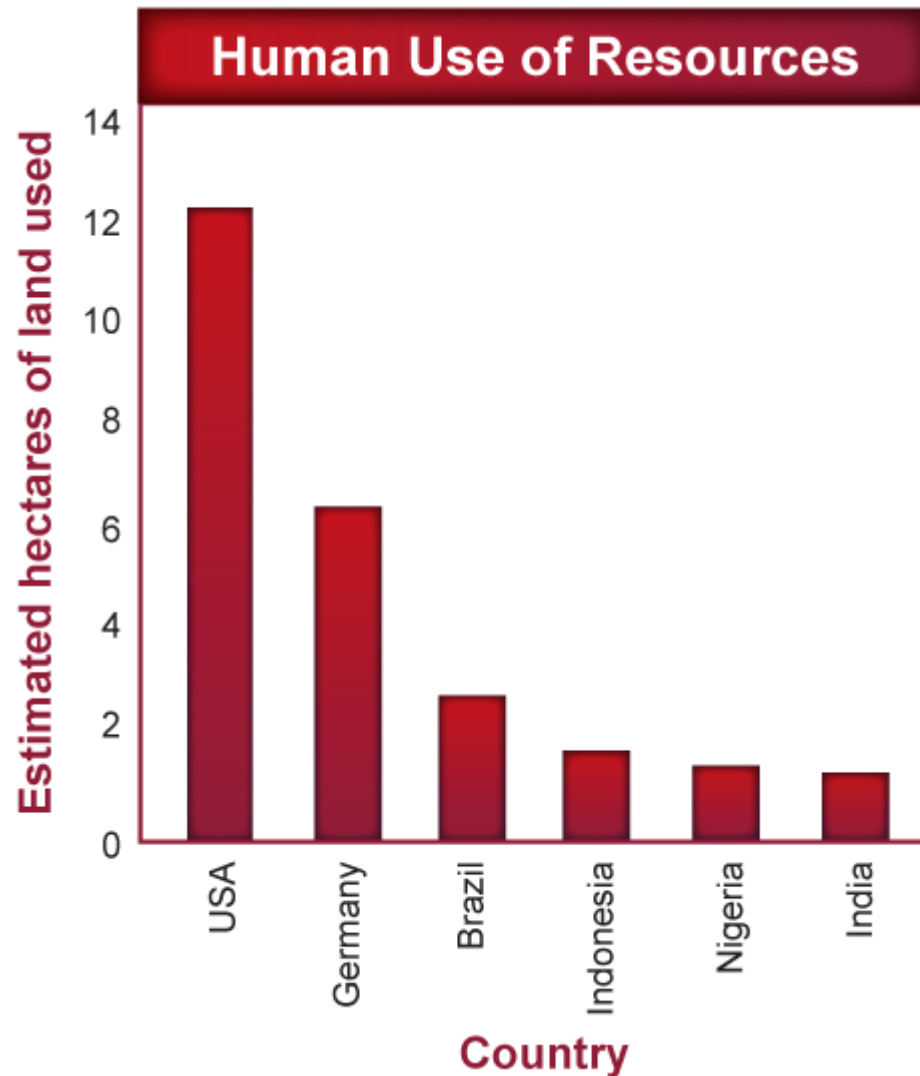


Human Population

Technological Advances

- For thousands of years, environmental conditions kept the size of the human population at a relatively constant number below the environment's carrying capacity.
- Humans have learned to alter the environment in ways that appear to have changed its carrying capacity.

Human Population



Human Carrying Capacity

- Scientists are concerned about the human population reaching or exceeding the carrying capacity.
- An important factor is the amount of resources from the biosphere that are used by each person.