**Population Ecology Part Two: Population Growth**

Remember that a ***population*** is the number of organisms of a particular species that live in one place at *one time*.

Populations change size according to the relative rates of birth/death and immigration/emigration:

If the **birth rate** is greater than the death rate, a population will *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

If the **death rate** is greater than the birth rate, a population will *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

If the rate of **immigration** is greater than the rate of emigration, a population will *\_\_\_\_\_\_*

If the rate of **emigration** is greater than the rate of immigration, a population will *\_\_\_\_\_\_\_*

If there are no limiting factors to control a population’s growth, it should grow *exponentially*.

 **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_:** the phenomenon where a population grows at a fixed rate and, therefore, the larger a population gets, the faster it grows.

At the early stages of an exponential growth curve, the population grows slowly. As time goes by and the population gets bigger, it begins to grow at a very fast rate.

Populations sometimes grow exponentially, but only until the population reaches its *carrying capacity*.

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_:** the *maximum* population that an ecosystem can support.

 Remember that population is a measure of individuals of *one* species.

 In any ecosystem, different species will have different carrying capacities.

In reality, exponential growth can only occur for a limited time because of finite resources that a population depends on for survival.

 **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_:** the pattern where the growth rate slows and stabilizes at a carrying capacity.

 An *Exponential growth pattern* is sometimes called a “**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**”

 a *Logistic growth pattern* is then called an “**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**”

*Ideally*, as a population nears its carrying capacity, the growth rate slows until there is zero growth and the population stabilizes.

This pattern repeats itself as the population fluctuates above and below the carrying capacity.

*In reality*, populations often overshoot their carrying capacity and the population experiences a “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_” which usually results in the population falling below the carrying capacity.

 Populations *below* the carrying capacity tend to *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*.

 Populations *above* the carrying capacity tend to *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*.

Carrying capacity is usually determined by one or more *limiting factors*.

 A **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is some kind of environmental pressure that restrains the exponential growth of populations.

Examples of limiting factors:

* availability of food
* availability of water
* availability of nutrients
* presence of predators
* presence of mates
* available habitat
* disease

Some limiting factors are related to population density.

 **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** are limiting factors whose influence depends on population density (e.g., disease, competition, predation, etc)

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** are limiting factors that do not depend on population density and usually relate to natural disasters.

(e.g., a tsunami would significantly affect the populations of a small coastal village as well as a large coastal city)

One important factor in understanding population growth is a species’ *biotic potential.*

 **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is the maximum ability to produce offspring in ideal conditions.

***K-selection* versus *r-selection***

Ecologists describe low and high biotic potentials with the categories of *K-selected* and *r-selected* species.

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** species tend to have high birth rates and high death rates.

They produce many offspring, have relatively small body size, short life-spans, and provide relatively little paternal care.

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** species tend to have lower birth rates, but the amount of parental care provided tends to result in lower death rates as well.

Compared to r-selected species, they produce few offspring, have large bodies, long life spans, and invest significant time and energy to parental care.

Populations of **K-selected** species \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and tend to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ near their carrying capacity.

Populations of **r-selected** species experience rapid bursts of exponential growth followed by rapid decline and thus tend to follow a “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_” population pattern.

The difference between K and r strategies can be thought of as “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ vs. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_”

Historically, technology and agriculture have helped push the Earth’s human carrying capacity higher and higher.

🡪 What *limiting factors* might determine the human carrying capacity of the Earth?

**Draw a sketch of the following curves:**

Exponential Growth:

Logistic Growth: