Population Growth

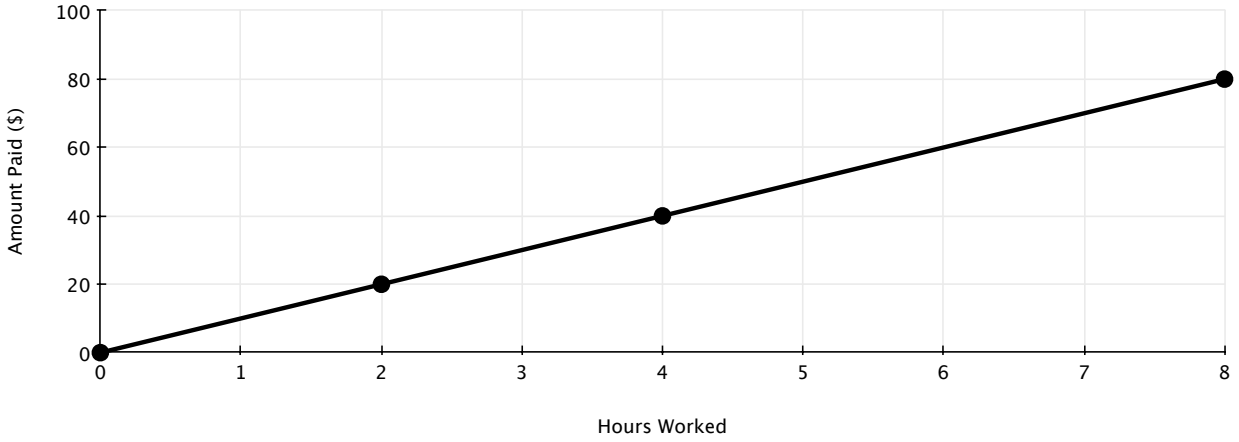
Recall that a **population** is a group of organisms of the same species living in an area. **Population growth** is defined as an increase in the size of a population over time.

How Fast do Populations Grow?

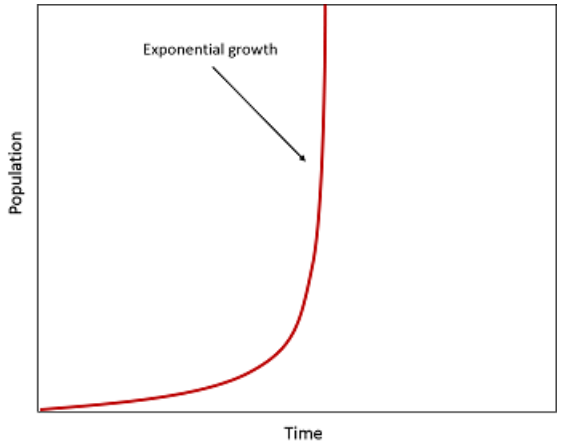
Suppose you worked for a company that pays you $10 per hour. The table below shows how much you would get paid after working a certain number of hours.

Hours	$ Paid
2	20
4	40
8	80

If you graph this data, you can see that the amount you are being paid increases at a linear rate.



Populations of organisms do not experience this linear growth. Instead, the graph of population growth tends to start out J-shaped, as illustrated below.



In the beginning, the population grows slowly because the number of reproducing individuals is small.

Later, as the population gets larger, the rate of growth increases because there are more reproducing individuals.

This pattern shows that populations grow exponentially. **Exponential growth** means that as a population gets larger, it also grows faster.

Limits to Population Size

A population cannot grow forever. Eventually, the size of a population will be limited by the availability of food and/or space. Any biotic or abiotic factor that limits the size of a population is called a **limiting factor**.

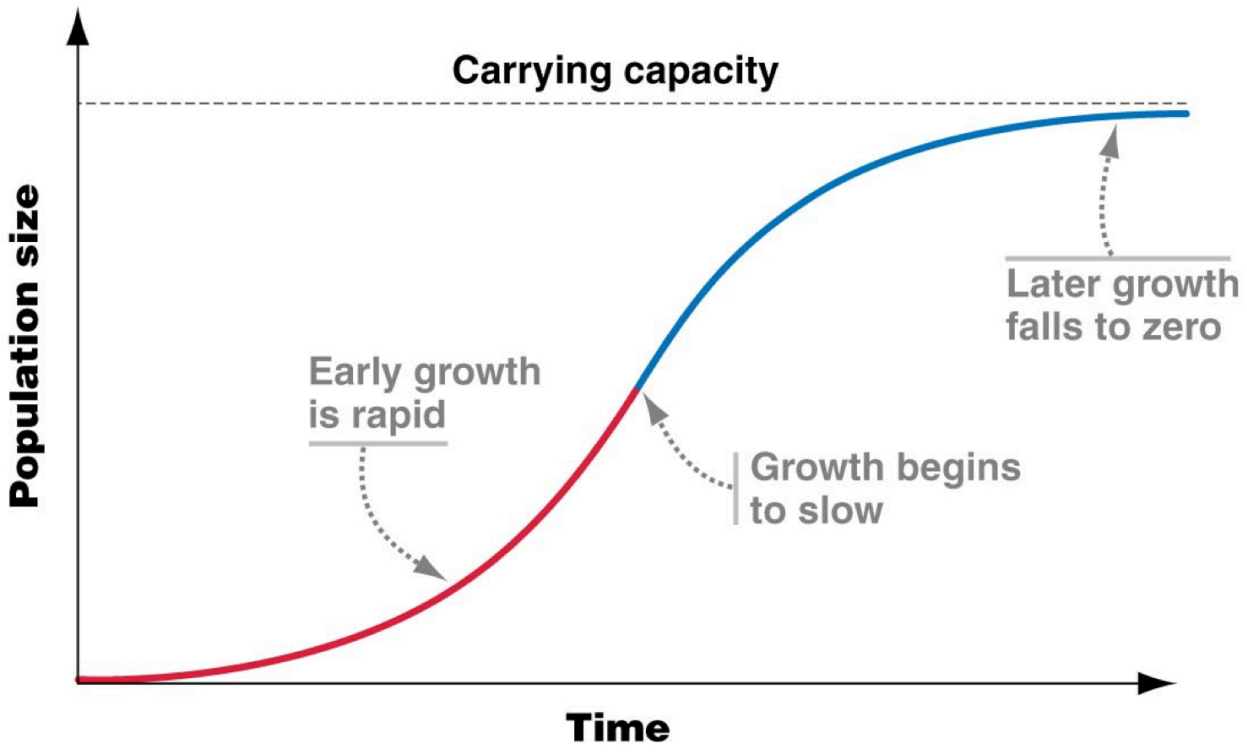
Limiting factors are generally grouped into two categories:

1. Density-Dependent
    - e.g. disease, competition, parasites, food, predators
    - have an increasing effect as the population gets larger

2. Density-Independent
    - e.g. temperature, storms, floods, drought, habitat disruption, pollution
    - are mostly abiotic factors
    - affect a population regardless of its size

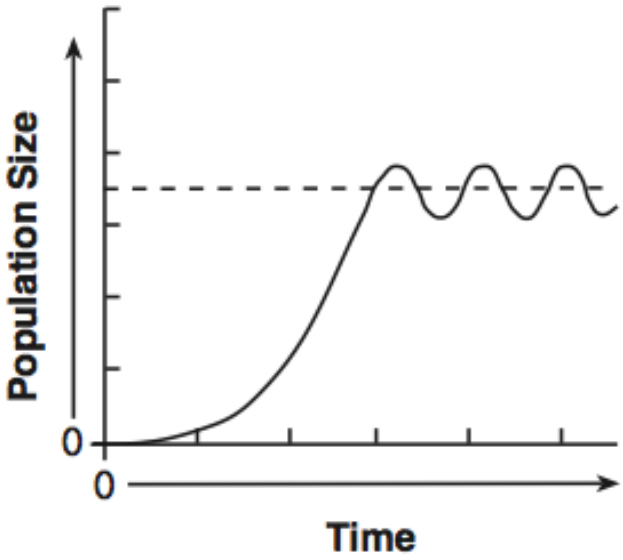
The maximum number of individuals of one species that an ecosystem can support is called its **carrying capacity**.

When the size of a population approaches the carrying capacity, its rate of growth will slow and the population size will level off, creating an S-shaped curve like the one below.



Note: When a population reaches its carrying capacity, growth does not truly stop. The population will actually fluctuate (go up and down) while remaining *around* the carrying capacity.

The graph below represents a more realistic picture of population growth.



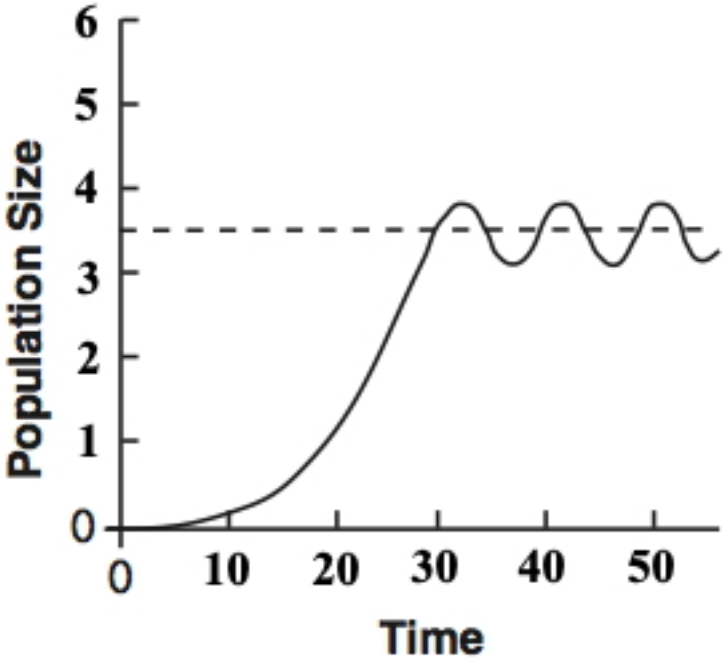
In the beginning, the population grows slowly because the number of reproducing individuals is small.

Later, as the population gets larger, the rate of growth increases because there are more reproducing individuals.

When the population reaches its carrying capacity, growth slows. The population levels off and fluctuates around the carrying capacity.

Worksheet

The graph below shows how the size of a population (in thousands) varies over time (in years). Examine the graph and answer the questions below.



1. Describe the rate of population growth during each of the following time periods:
   a) 0 to 10 years _____
   b) 15 to 25 years _____
   c) after 30 years _____

2. What does the dotted line represent? _____

3. Estimate the carrying capacity of the ecosystem for this species. _____

4. Why do you think the population size goes up and down after year 30?

_____

_____

_____

_____

_____