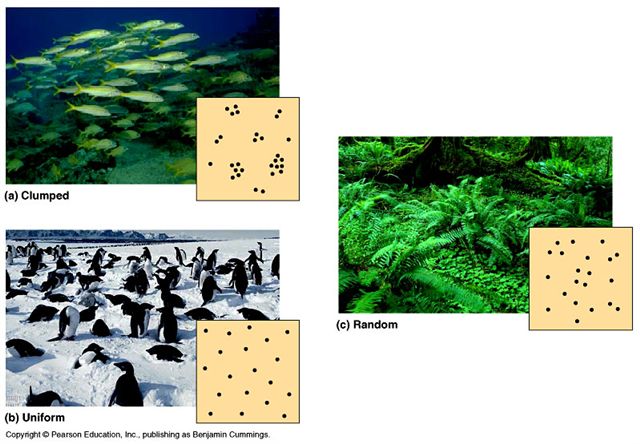
Populations Notes

**What is a Population?**

* All the members of a \_\_\_\_\_\_\_\_\_\_\_\_ living in the same \_\_\_\_\_\_\_\_\_\_\_\_ at the same \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Examples: Palm trees on an island, a school of specific fish, and daisies in a field in Ohio.

**Properties of Populations**

* Population \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_-the number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ per unit area or volume
  + Example: the number of small mouth bass per cubic meter of water in a lake.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_- the relative distribution or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of its individuals within a given amount of space.



Clumped

Random

Uniform

**How Does a Population Grow?**

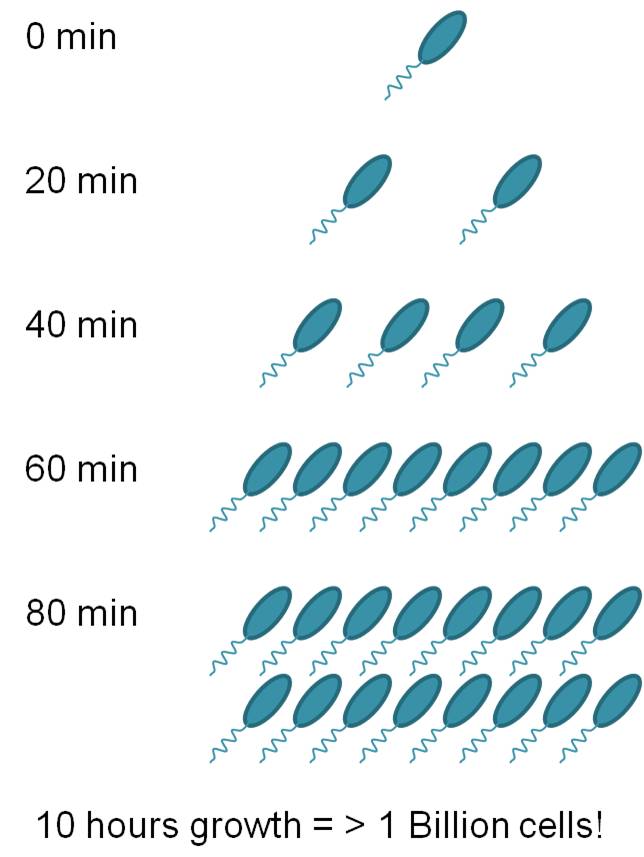
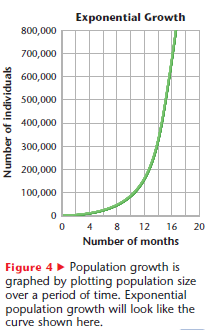
* Growth Rate- the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ minus the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of a population.
* Change in population size = Births - Deaths

**How Fast Can a Population Grow?**

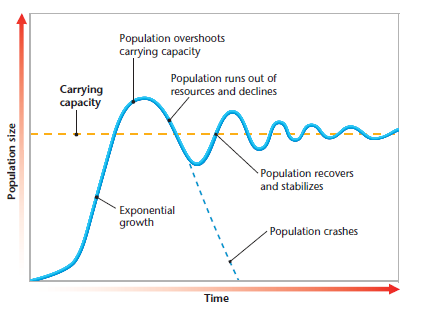
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: The fastest rate at which its potential population can grow.
* Reproductive Potential: The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that each member of the population can produce.
* If perfect conditions, it would take a pair of elephants \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to produce 19 million descendants.

**Exponential Growth**

* A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_could produce 19 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ new cells in a few days or weeks.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ growth is an example of this.



**Carrying Capacity**

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ population that the ecosystem can support indefinitely.
* While a population may \_\_\_\_\_\_\_\_\_\_\_\_\_\_ beyond this number, it will not remain at this increased size.
* Example:
  + Rabbits in Australia demonstrate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ growth and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
  + Originally, there were \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ rabbits in Australia.
  + When they were introduced in 1859, their numbers grew \_\_\_\_\_\_\_\_\_\_\_\_\_\_ because they had plenty of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, no \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and no \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
  + Eventually, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ caused the rabbit population to crash. Over time, the vegetation \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and the rabbit population began to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ again.
  + The increasing and decreasing cycle continues, though less dramatically, as the population stays closer to the carrying capacity over time.

**Resource Limits**

* A species reaches its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ when it consumes a particular natural resource at the same rate at which the ecosystem \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the resource.
* That natural resource is called a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* For example, plant growth is limited by supplies of \_\_\_\_\_\_\_\_\_\_\_\_\_, sunlight, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* The supply of the most \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ limited resources determines the current carrying capacity.

**Two Types of Population Regulation**

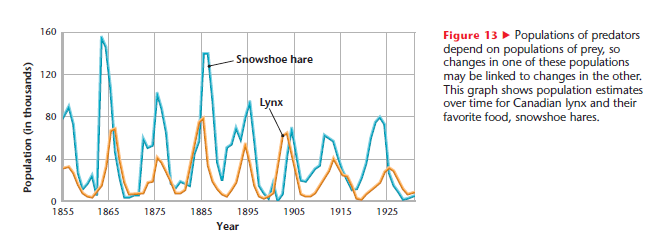
1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + Deaths occur more quickly in a crowded population than in a sparse population.
  + Reasons for deaths-
    - Competition
    - Predation
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   * When certain portions of the population die regardless of how dense the population is.
   * Reasons for deaths:
     + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
     + Natural disasters
     + Human actions (deforestation, damming a river, hunting, etc.)

Ecological Relationships Notes

**Predation**

* An organism that feeds on another organism is called a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* The organism that is fed upon is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Examples:
  + Snakes eating \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
  + \_\_\_\_\_\_\_\_\_\_\_\_ eating insects.
  + Whales consuming \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Some predators eat only \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ types of prey.
* In this type of relationship, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ of each population tend to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in linked patterns.

**Competition**

* Competition is a relationship in which \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ individuals or populations attempt to use the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ limited resource.
* Each individual has \_\_\_\_\_\_\_\_\_\_\_\_ access to the resource and so is \_\_\_\_\_\_\_\_\_\_\_\_ by the competition.
* Competition can occur both \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ species.
* Indirect competition occurs when species \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ come in contact with each other.
  + Examples:
    - If one species \_\_\_\_\_\_\_\_\_\_\_\_\_ on a certain plant during the day and another species feeds on the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ plant at night.
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ rarely interact with the insects that eat our \_\_\_\_\_\_\_\_\_\_\_\_\_, but the insects are still competing with us for food.

**Symbiosis**

* The close association between two or more organisms of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ species
* Three types of symbiosis:
  1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  2. Commensalism
  3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Mutualism**

* A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ relationship between two organisms of different species in which each member \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Examples:
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_perched on a black rhinoceros get food (pests on rhinos) and help the rhino get rid of pests
  + One kind of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ lives in the guts of termites and digests the cellulose in the wood that the termites eat. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the protozoa, the termites could not completely digest the cellulose.
  + Some types of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ grow on the roots of plants and release an acid that changes minerals in the soil into forms that plants can \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
  + You and a species of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that lives in your intestines benefit each other! The bacteria get a plentiful food supply from you and in return you get \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_that the bacteria produce.
  + The living corals near the surface of the water provide a home for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. The algae produce food through \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that is used by the corals.

**Commensalism**

* A symbiotic relationship between two organisms of different species in which one organism \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ without \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the other organism
* Examples**:**
  1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_attached to a gray whale gain a home and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to areas with food while leaving the whale unaffected.
  2. Remoras hitch a ride and feed on scraps of food left by sharks. The remoras \_\_\_\_\_\_\_\_\_\_\_\_\_\_ from this relationship while sharks are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
  3. The Cattle \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(*Bubulcus ibis*) is often found in pastures following horses and cattle. As the livestock graze, insects are stirred up by their movement and this provides \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_for the egrets.
  4. The Great Burdock *(Arctium lappa)* has spines on its seeds that curve upward which allow the seeds to attach themselves to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of passing animals. The plant \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_by having its seeds dispersed in a large area and the animals are not affected.
  5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ receive more sunlight for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ if they grow high on tree branches. The orchid plants are helped by the tree. The tree gets nothing in return from the orchids.

**Parasitism**

* A symbiotic relationship between two organisms of different species in which one organism \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and the other is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
  + The organism that benefits is called the *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*.
  + The organism that is harmed is called the *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*.
* The parasite gets nourishment from its host, which is weakened in the process. Sometimes a host organism becomes so weak that it dies.
* Some parasites, such as ticks, live \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_the host’s body.
* Other parasites, such as tapeworms, live \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the host’s body.
* Examples of Parasitism
  + The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ parasite, *Giardia Lamblia*, lives in the digestive tracts of humans and other vertebrates causing \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and severe stomach cramps. *Giardia* lives in water and sometimes hikers drink infected water.
  + A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ on a human scalp receives \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ by drinking the human’s blood, and also causes a rash or irritation.
  + A female \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ lays \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in a caterpillar. When the eggs hatch, the wasps eat the caterpillar alive!
  + A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ uses the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the rabbit for nourishment.
  + Lampreys attach to fish causing sores.