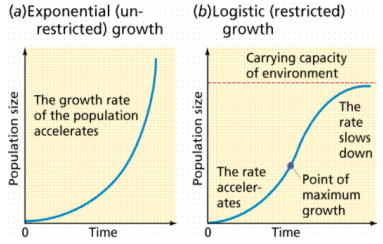
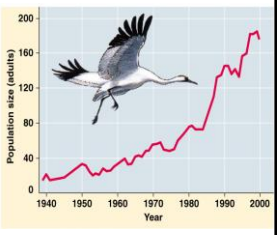
Population Growth Models

There are two main types of population growth:

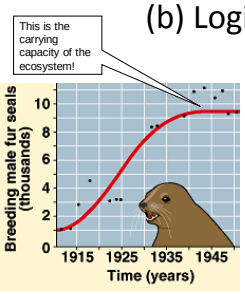


(a) Exponential Growth

- describes an idealized population in an unlimited environment
- J shaped curve
- Occurs as long as there is a plentiful supply of the resources it needs



(b) Logistic Growth



- S shaped curve
- Typically, resources in an ecosystem are limited - no population can grow forever!
- This results in a maximum number of organisms that an ecosystem can support – called the CARRYING CAPACITY.

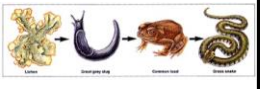
Carrying Capacity

- If the number of organisms in a population is below the ecosystem's carrying capacity, births exceed deaths and the population grows.
- If the number of organisms rises above the carrying capacity, the deaths will exceed the births. This pattern will continue until the population is once again at or under the carrying capacity.

4 main factors:

1. Materials and Energy – Species require energy from the sun, water, and nutrients to survive.

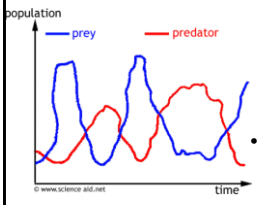
2. Food Chains - All populations are limited by their source of energy. Interestingly, populations are also limited by their predators.



Predator-Prey Relationships

- One organism (the predator) hunts and kills another organism (the prey). This relationship is referred to as predation.
- Predators benefit – they get food. But prey also benefit! Predators usually eat the sick, old, or weak prey. This leaves more food for the healthy animals in the prey population.

Predator-Prey Relationships



- When the number of predators is scarce the number of prey rise. When this happens the predators reproduce more.
- As the number of predators rises, the number of prey decline. This results in food scarcity for predators that can eventually lead to the death of many predators.

4 main factors:

3. Competition – Individuals compete for resources such as food (animals), nutrients (plants), shelter, light, and water.

Competition occurs among members of the same species (intraspecific competition) and between species (interspecific competition).

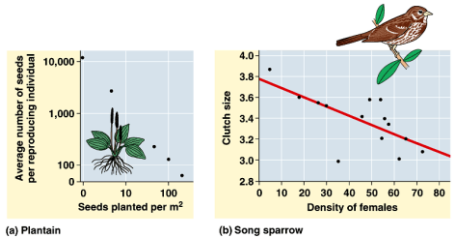
4 main factors:

4. Density - Populations need space to live.

Density-dependent factors increase their effect on a population as population density increases. This is a type of negative feedback.

Density-independent factors are unrelated to population density, and there is no feedback to slow population growth.

Examples of Negative Feedback

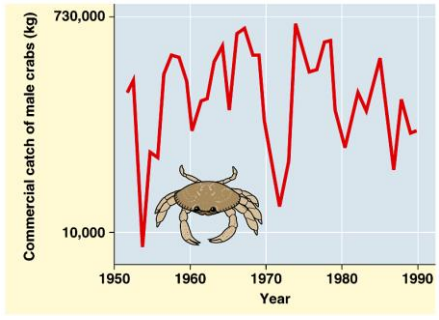


Resource limitation in crowded populations can stop population growth by reducing reproduction.

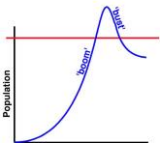
Population dynamics reflect a complex interaction of biotic and abiotic influences

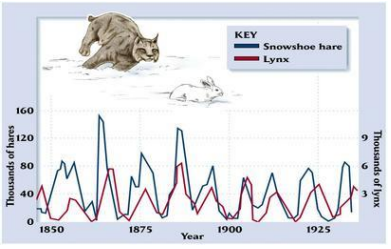
- Carrying capacity can vary.
- Year-to-year data can be helpful in analyzing population growth.

- Some populations fluctuate erratically, based on many factors.



- Other populations have regular boom-and-bust cycles.
  - A good example involves the lynx and snowshoe hare that cycle on a ten year basis.





Any Questions?