Ecology 2 Notes Pre AP

Chapters 5 and 6

Growth
5.1

Characteristics of a population

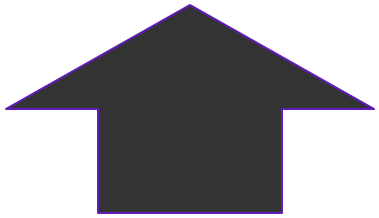
Populations:

- Geographic range= where pop. lives
- **Population density** – # of individuals / area
- **Growth rate** – # of births and deaths, and # moving in or out

Population Growth

- Pop. Size
  1. # births
  2. # deaths
  3. # of ind. enter or leave a pop. (immigration and emigration).
- Immigration - organisms moving IN
- Emigration - organisms Exiting

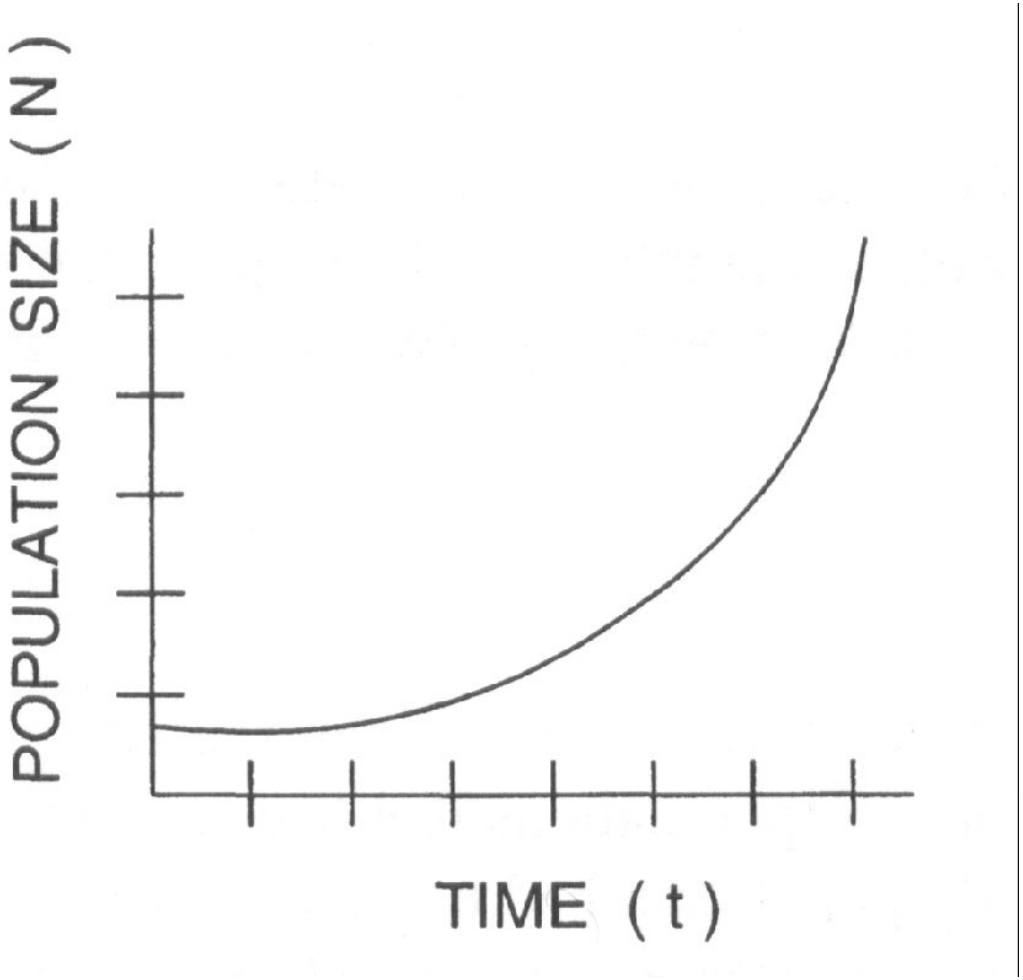
Population Growth, cont.



- Birthrate
- Immigration

- Death rate
- Emigration

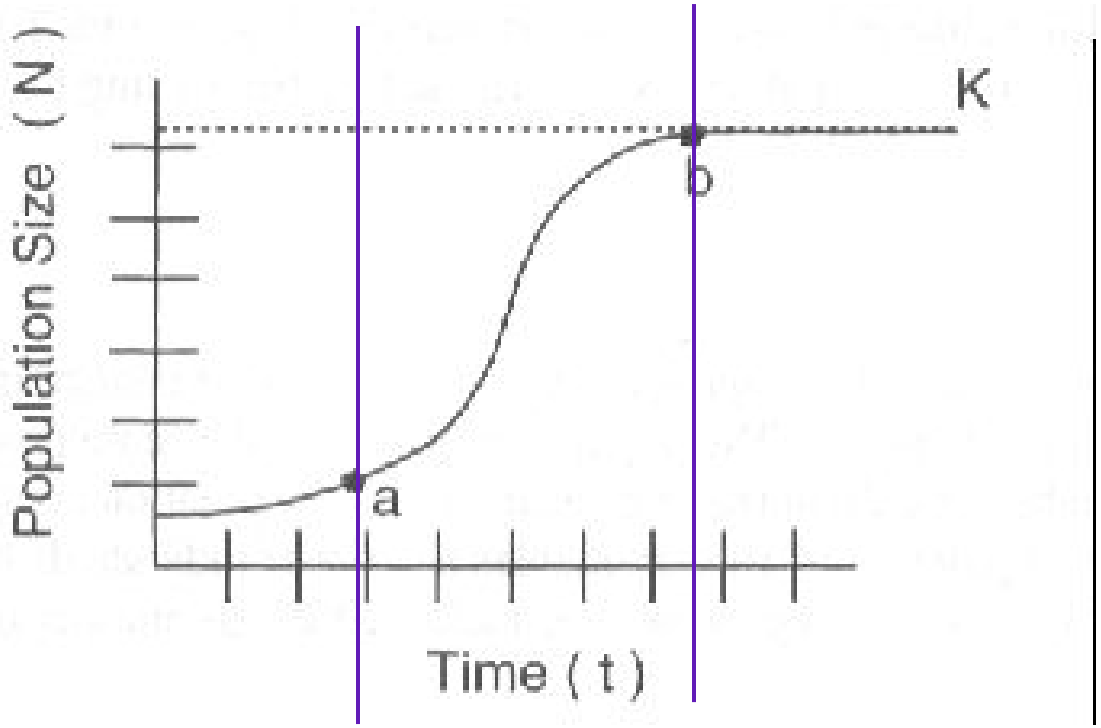
Exponential Growth



Exponential Growth

- GROWTH AT CONSTANT RATE
  - Under ideal (perfect) conditions
  - no disease/predation
  - Unlimited resources
  - Larger pop. gets, faster it grows
  - J-Shaped curve
  - Can’t last forever…

Logistic Growth



Logistic Growth, cont.

- Phases: slow, exponential, no growth
  - Lag growth
  - Exponential Growth – growth increases at constant rate
  - Growth Slows – increase of competition for resources
  - Growth "stops"- *Will still be small ups and down in pop. size…*
- Carrying Capacity - Largest number of individuals area can support
  - Birthrate = Death rate &
  - Immigration = Emigration

Limits to Growth

5.2

Limiting Factors

Controls growth of population (biotic or abiotic)

Limiting Factors

Density-dependent

High population density NOT small scattered populations

- Competition
- Predation/Herbivory
- Parasitism/Disease
- Stress from Overcrowding

Competition

- Crowded – compete for
  - Food
  - Space
  - Sunlight
- More organisms = faster resources are used up

Predation & Herbivory

- Rise and fall
- Increase and decrease irregular

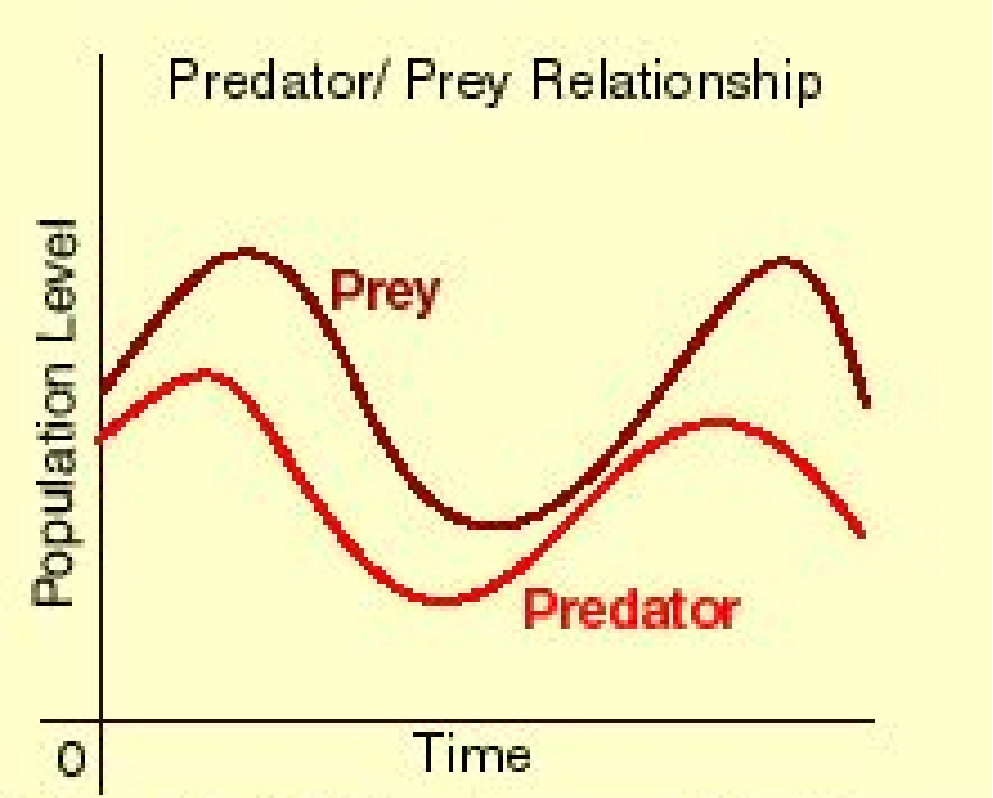
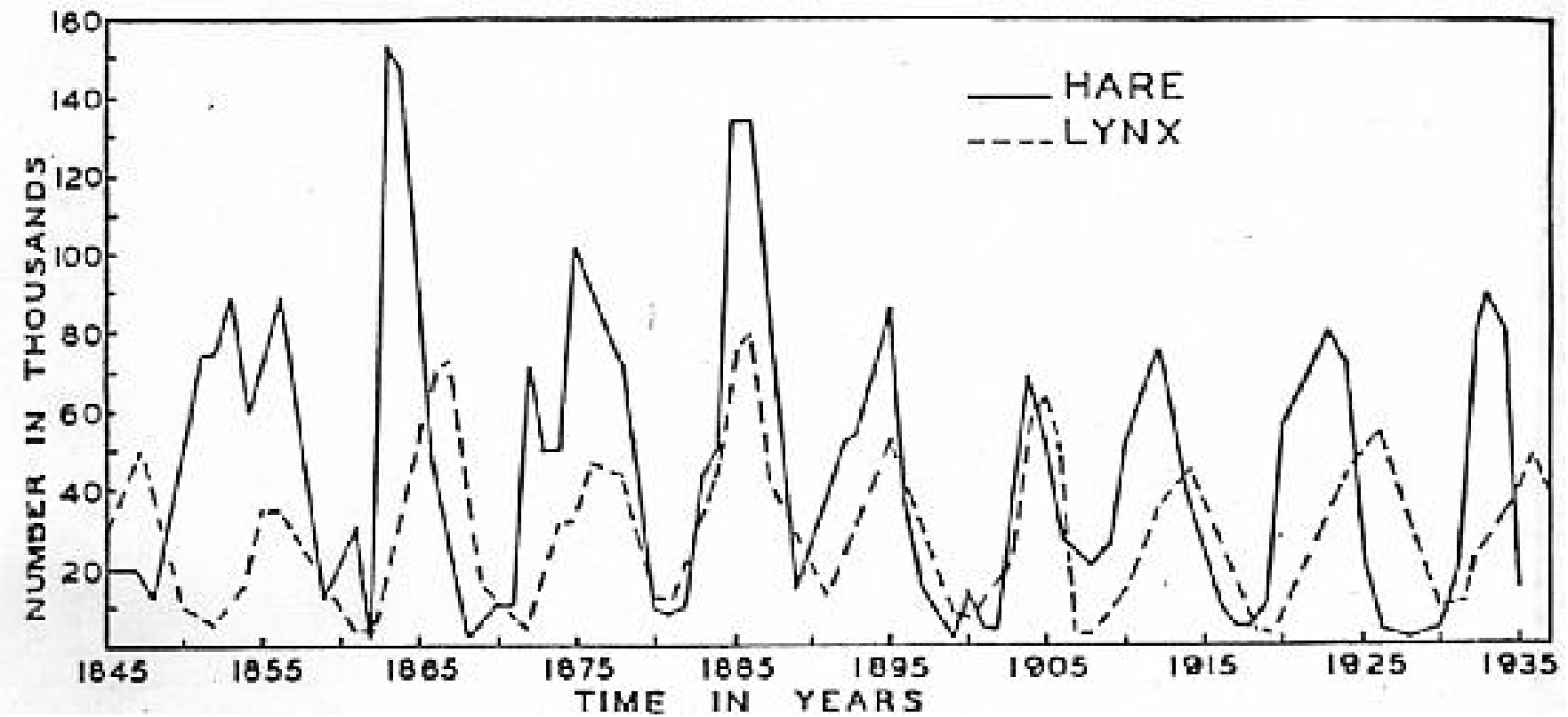


Figure 1 - As Prey decrease Predators decrease. Prey recovers then Predators recover

Hare vs. Lynx Graph

- Hare = Prey Lynx = Predator



Parasitism and Disease

- Denser the pop., easier for parasites to spread

Stress from overcrowding

- Fight if overcrowded
- Fighting = stress
- Can lead to females _____ offspring
  - Neglect
  - Kill
  - Eat

Limiting Factors

Density-independent limiting factors affect pop., regardless of density

- Unusual Weather
- Natural Disasters
- Humans

Human Populations 5.3

Review

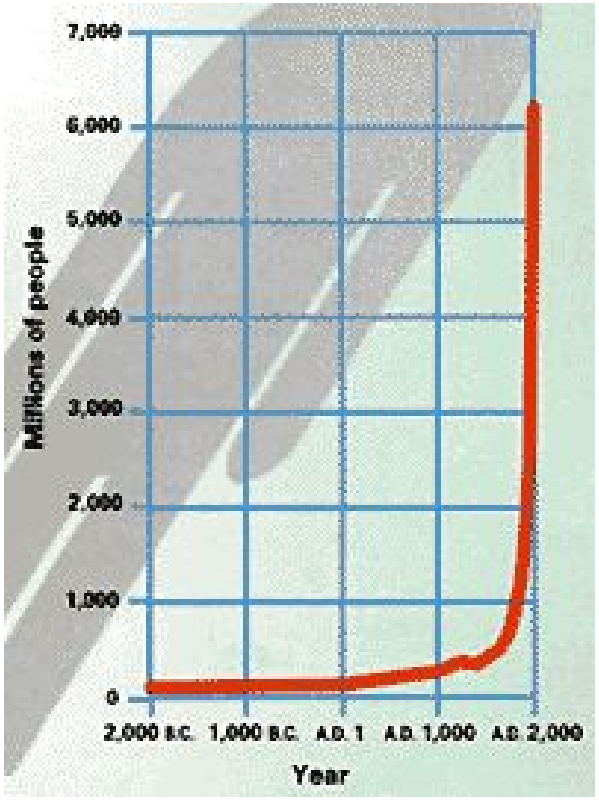
Exponential Growth

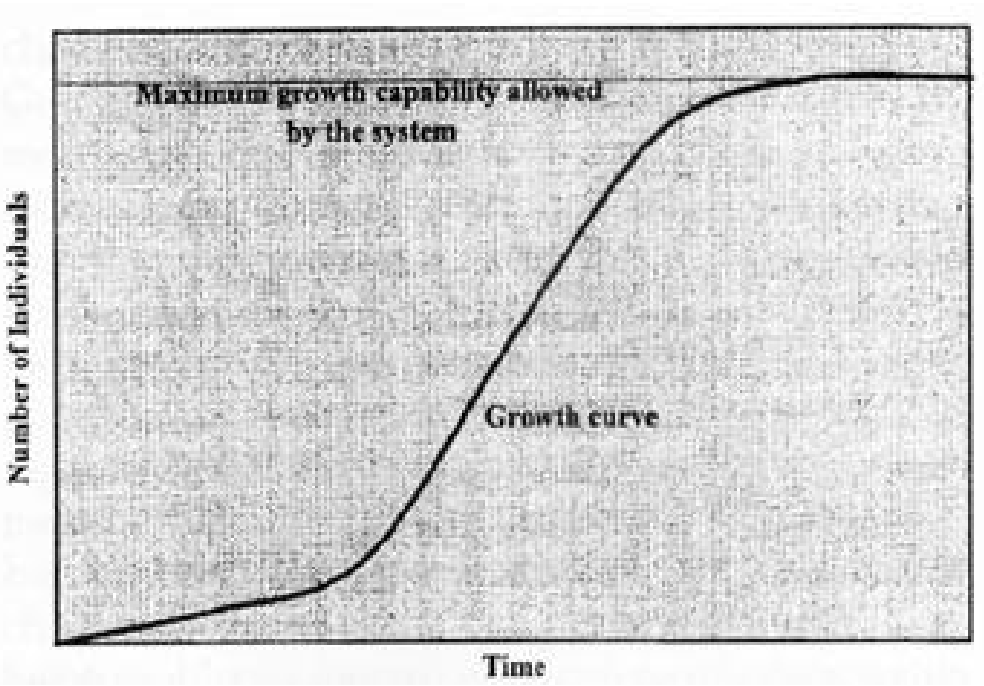
- Occurs when the individuals in a population reproduce at a constant rate.
- Over time, the population becomes larger and larger until it approaches an infinitely large size.
- For populations that continue to grow at high rates – current human population growth

Review

Logistic Growth

- As resources become less available, the growth of a population slows or stops.

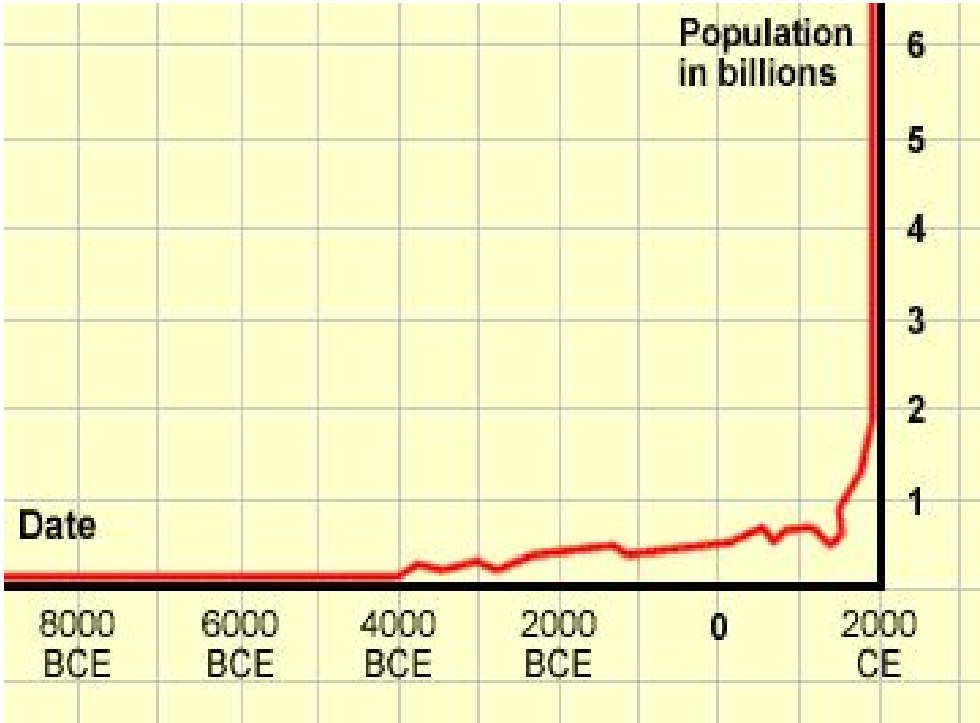




Historical Overview

- Like the populations of many other living organisms, the size of the human population tends to increase with time.
- Until recently, human population growth was slow due to limiting factors such as disease, scarce food, etc.

- There were high death rates associated with this.
- For most of human existence, only half the children in the world survived to adulthood.



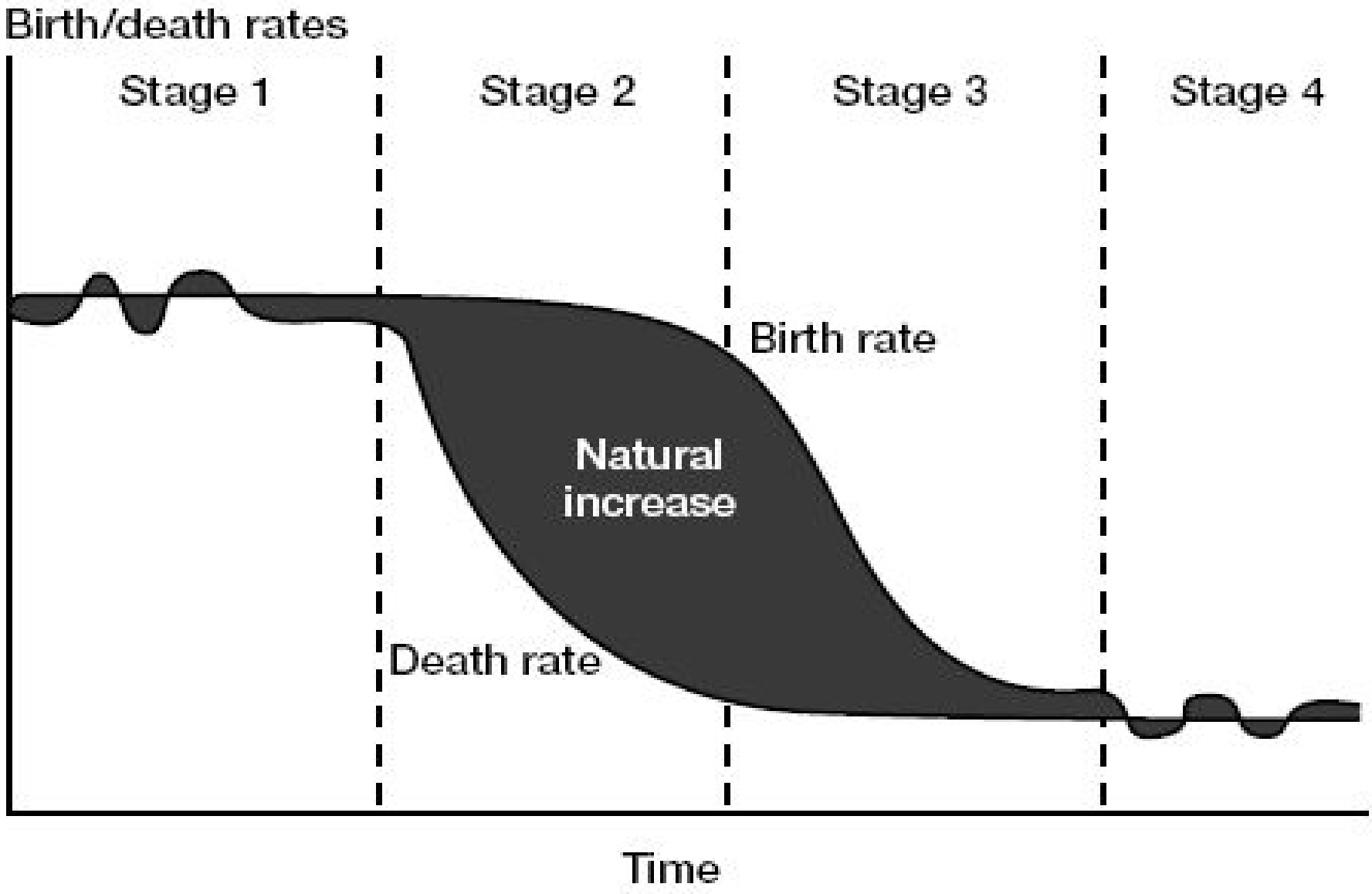
Population BOOM

- About 500 years ago, the human population began growing more rapidly.
- Food more reliable
- Nutrition
- Sanitation
- Medicine
- Healthcare
- agriculture

Demography

- Study of human populations

The Classic Stages of Demographic Transition



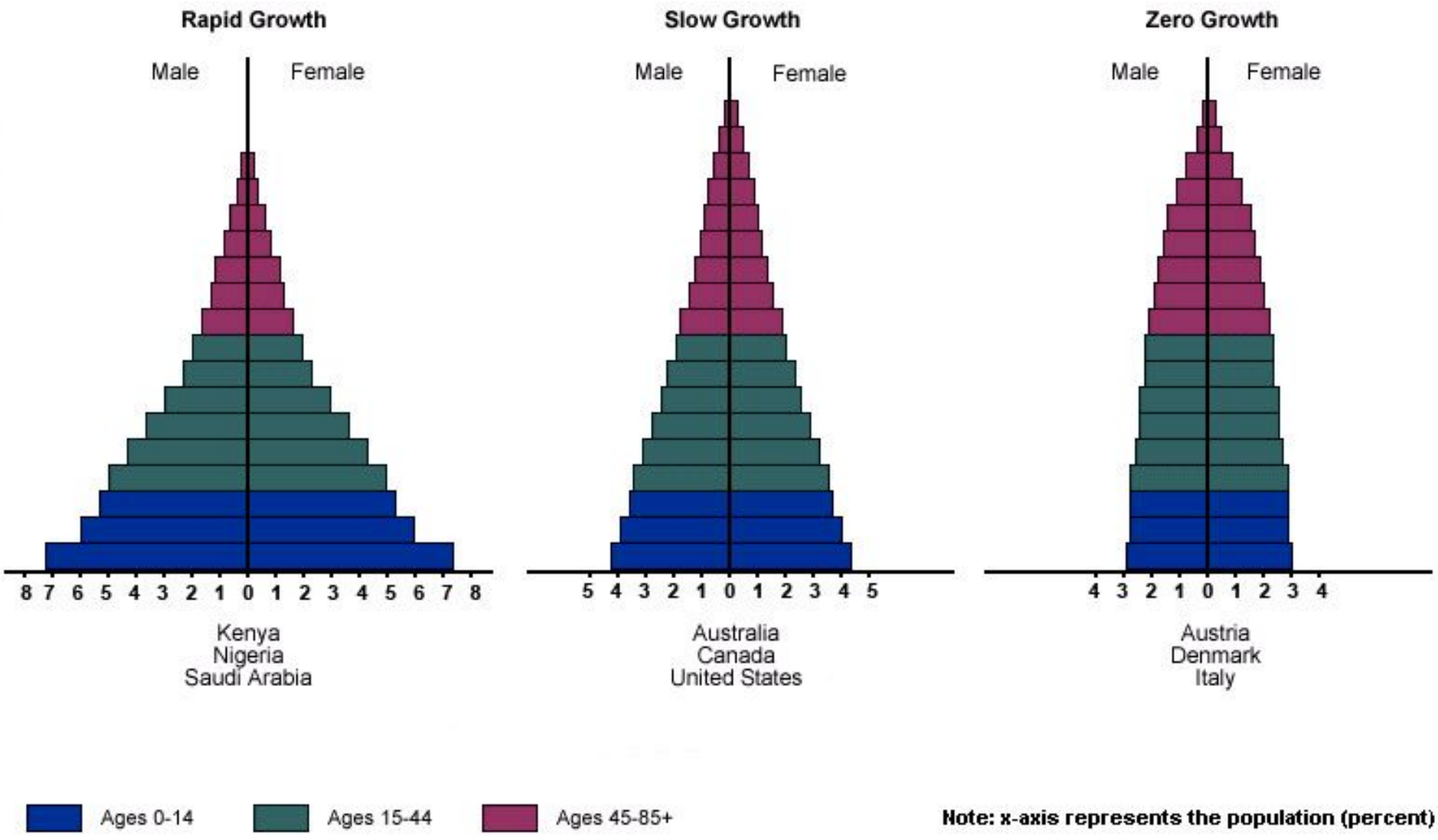
Starts with high BR and DR ends with Low BR and DR

The Demographic Transition

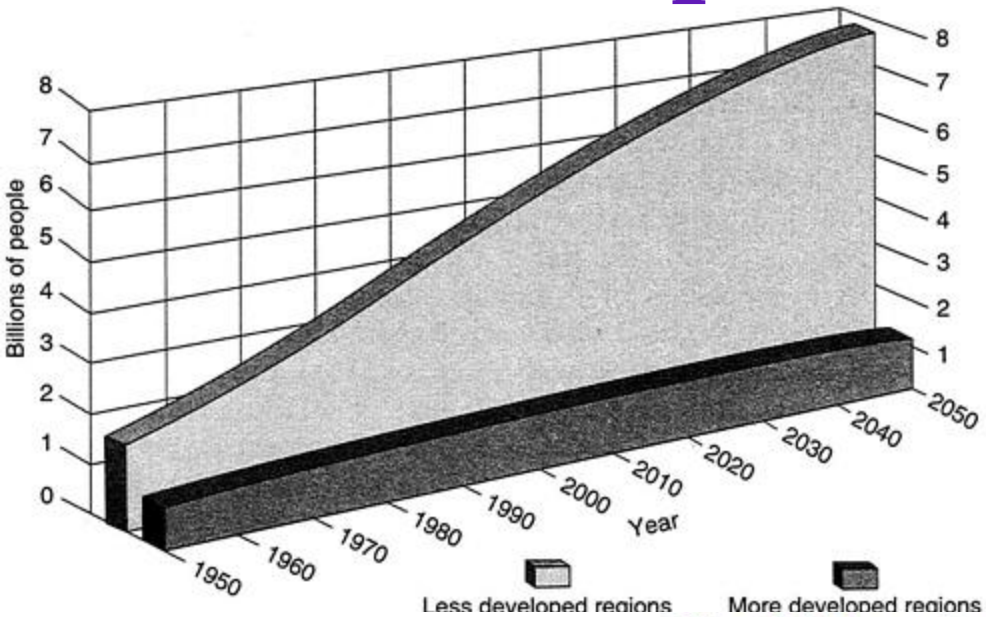
- The scientific study of human populations is called demography.
- Demographers note that over the past century population growth in the US, Japan, and much of Europe has slowed dramatically.
- These countries have completed the demographic transition which you saw earlier.

Age Structure

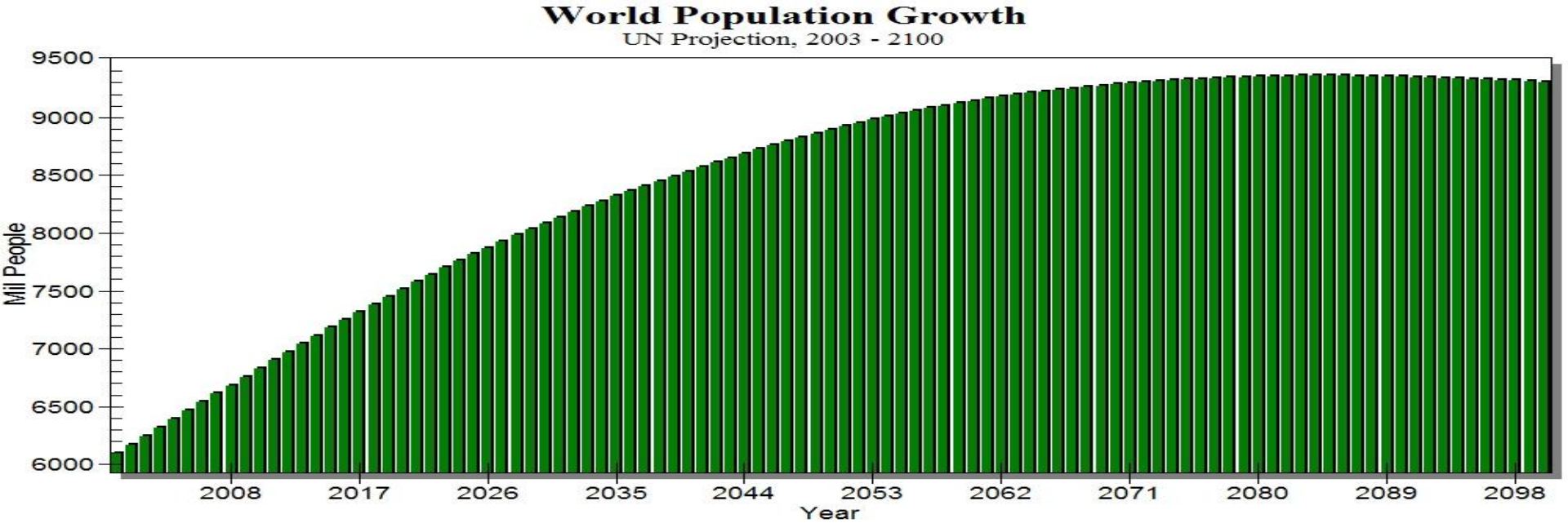
- Population growth depends, in part, on how many people of different ages make up a given population.
- Demographers use age structure diagrams to predict population growth.
- # of females and males per age in a pop.


Rapid Growth
Male
Female
8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8
Kenya
Nigeria
Saudi Arabia
Slow Growth
Male
Female
5 4 3 2 1 0 1 2 3 4 5
Australia
Canada
United States
Zero Growth
Male
Female
4 3 2 1 0 1 2 3 4
Austria
Denmark
Italy
Ages 0-14
Ages 15-44
Ages 45-85+
Note: x-axis represents the population (percent)

Future Population Growth



- Will the human population grow at its current rate, or will it level out to a logistic growth curve and become stable?



Biodiversity and Human Impact

Chapter 6

Biodiversity

- Diversity = Variety
- Biodiversity = Variety of living things!

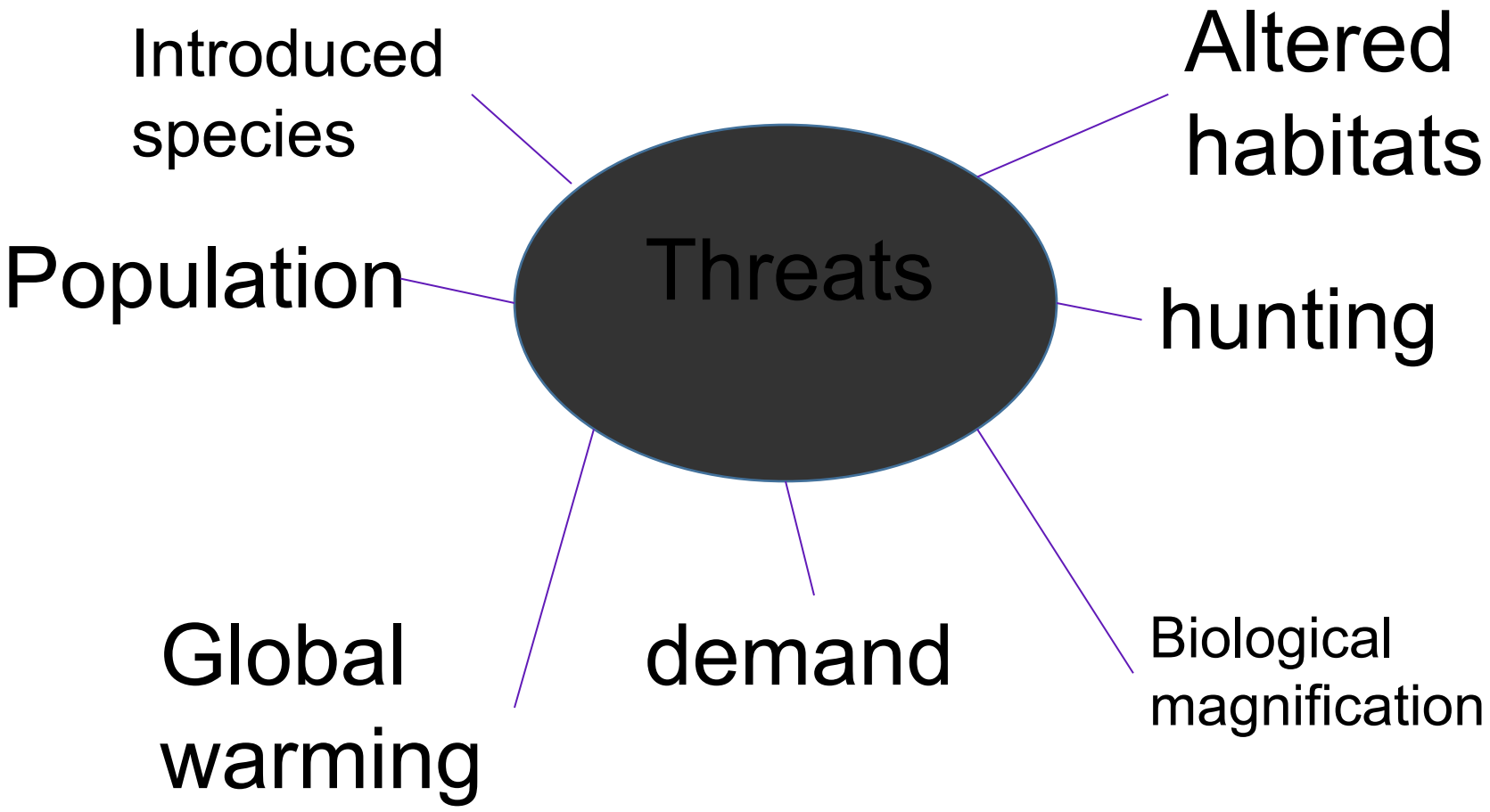
Importance of Biodiversity

- The greater the biodiversity of an ecosystem, the greater chance the ecosystem has to survive.
- If a forest is full of Ash trees, and a disease that only affects Ash trees enters that population, the forest will die.
- If a forest has 1/5 Ash trees, 1/5 Pine, 1/5 Oak, 1/5 Sycamore, and 1/5 Maple trees, and that same Ash Tree Disease enters the ecosystem and kills all of the Ash trees, the forest will still survive.

Biological Diversity

Benefits to humans

1. *Medicine*
2. *Agriculture*
3. *Goods*
4. *Services*
5. *Interdependence*


Introduced species
Altered habitats
Population
Threats
hunting
Global warming
demand
Biological magnification

Threats to Biodiversity

Habitat fragmentation – *the separation of wilderness areas from other wilderness areas.*

- Development that splits ecosystem into pieces leaving habitat “islands”
  - Small populations
  - Fewer species (decreasing biodiversity)
  - More vulnerable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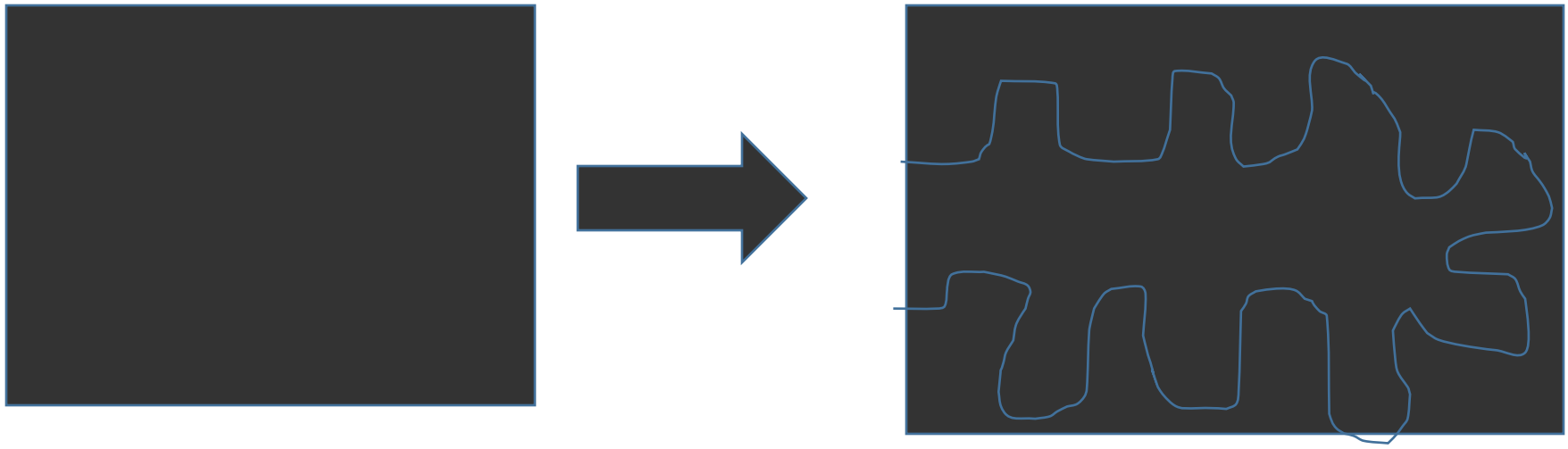
Housing Addition



Threats: Habitat Alteration

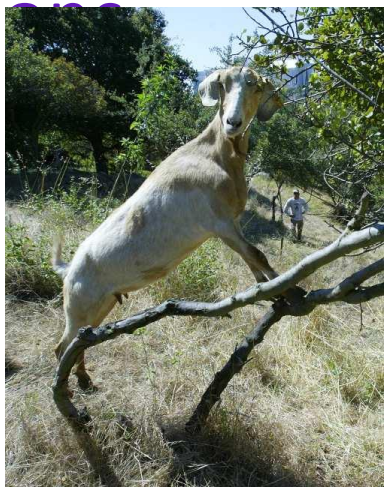
- As development splits ecosystems into pieces, known as habitat fragmentation, and as a result, the remaining pieces of habitat become biological islands.
- Habitat islands are different from continuous ecosystems because the smaller the island, the less the chance for diversity to survive.

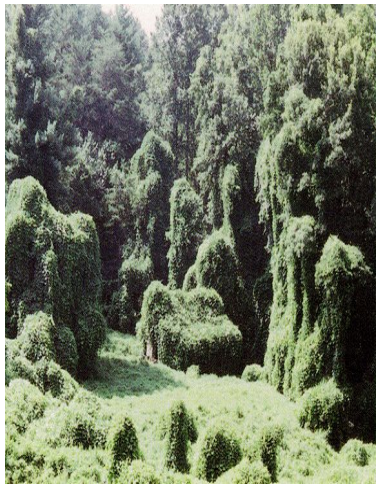
- Habitat fragmentation results in numerous small, disjunct habitat patches left for use by wildlife.
- Fragmentation eliminates habitat for those species requiring large unbroken blocks of habitat.
- Additionally, the small habitat patches resulting from fragmentation often do not provide the food and cover resources for many species that do attempt to use them

This can result in an increased risk of death by predation, if the animal has to venture beyond the cover of the patch to find new food resources, or starvation.

13. Non-native species to an area are referred to as *invasive species*.

- Introduced by people intentionally or accidently
  - ❖Problems cause:
  - ❖Uncontrolled growth
  - ❖Take over space and resources
  - ❖No natural predators
  - ❖Decrease natural populations
- Examples
  - ❖ Zebra mussels
  - ❖ European starling

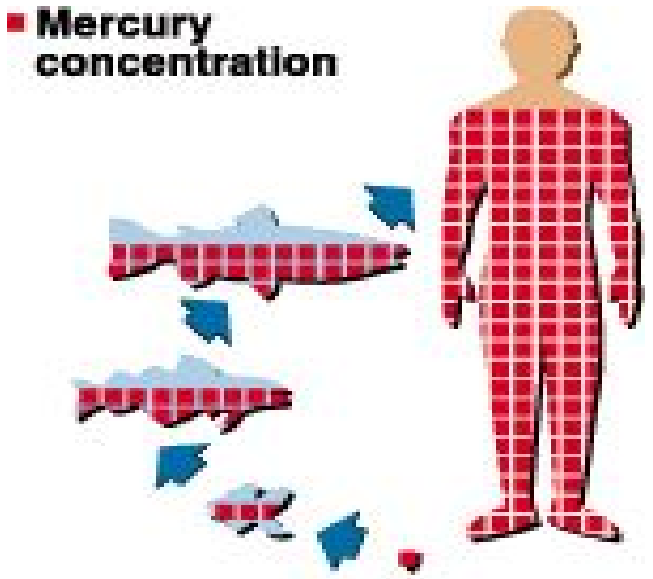




oss of Biodiversity

Biological Magnification

- Concentrations of a harmful substance increase in organisms at higher trophic levels in the food chain/ web.
- Example: Mercury
  - Impairs hearing & vision
  - Corrodes skin
  - Involuntary muscle movements



- One of the first widely used pesticides
- Was cheap, remained active for a long time, and killed many different insects

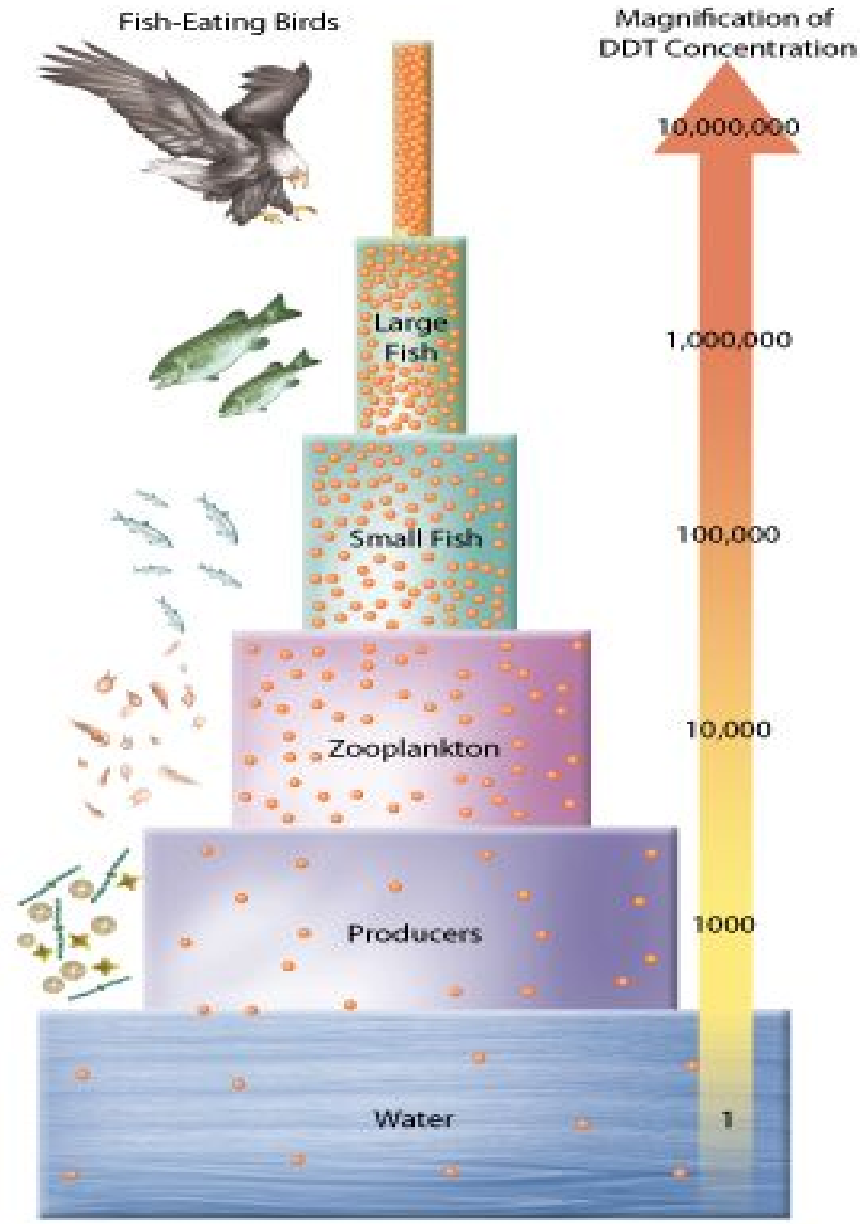
- When DDT was sprayed, it eventually drained into rivers and streams.
- DDT is nonbiodegradable and organisms do not eliminate DDT from their bodies.

The history of DDT

- Because it is not eliminated from organisms: The following chain can happen.

1. An aquatic plant picks it up
2. A herbivore eats many plants and the DDT level is then approximately 10 times higher than in the plant.
3. Carnivore eat the herbivores, the DDT becomes more concentrated, increasing by 10 times every trophic level.

Why DDT is bad



Conservation of Biodiversity

Conservation biology is the study and implementation of methods to protect biodiversity.

- Natural resource conservation and species conservation