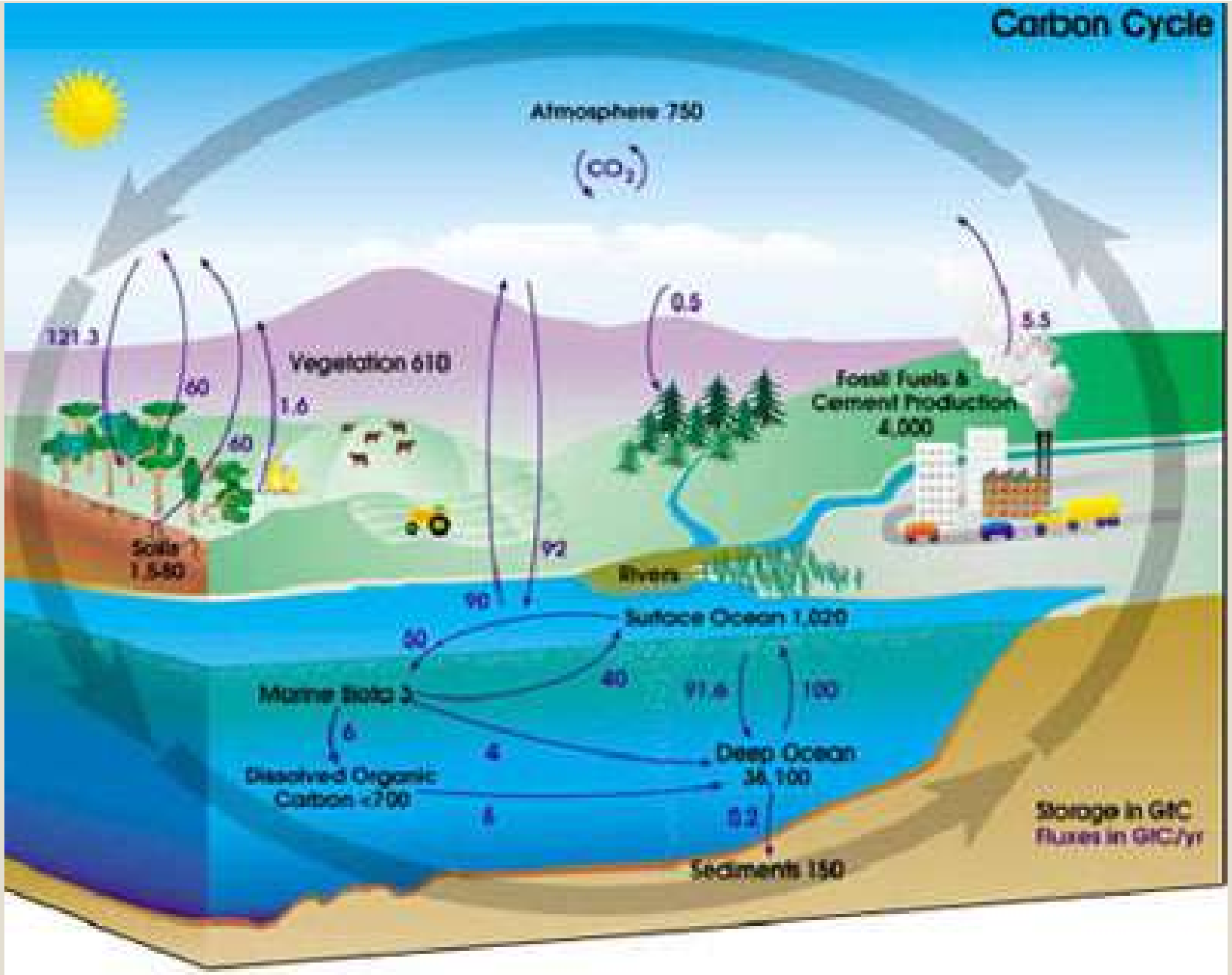
Sunday's Marchs Around the World

Carbon, Hydrologic, Phosphorus Cycle 9/24

Obj. TSW identify the parts of the Carbon, Hydrologic and Phosphorus Cycle

- 1. Explain how the carbon cycle and global warming are connected.
- 2. List the steps for the Hydrologic Cycle and how Humans can alter the cycle
- 3. List the steps for the Phosphorus Cycle and explain what happens when there is excess phosphorus?


Carbon Cycle
Atmosphere 750
(CO_2)
121.3
60
60
1.6
Vegetation 610
0.5
5.5
Fossil Fuels &
Cement Production
4,000
Soils
1,580
92
90
Rivers
Surface Ocean 1,020
50
40
91.6
100
Marine Biota 3
6
4
Deep Ocean
38,100
Dissolved Organic
Carbon 700
0.2
Storage in GtC
Fluxes in GtC/yr
Sediments 150

Carbon Cycle and GHG

- Industrial Revolution
- Combustion of fossil fuels
- Tree harvesting
  - Cutting and burning
  - Replanting trees

-Increased carbon= upsets balance between carbon pools and atmosphere

-Increases heat retention= Greenhouse Gas Effect

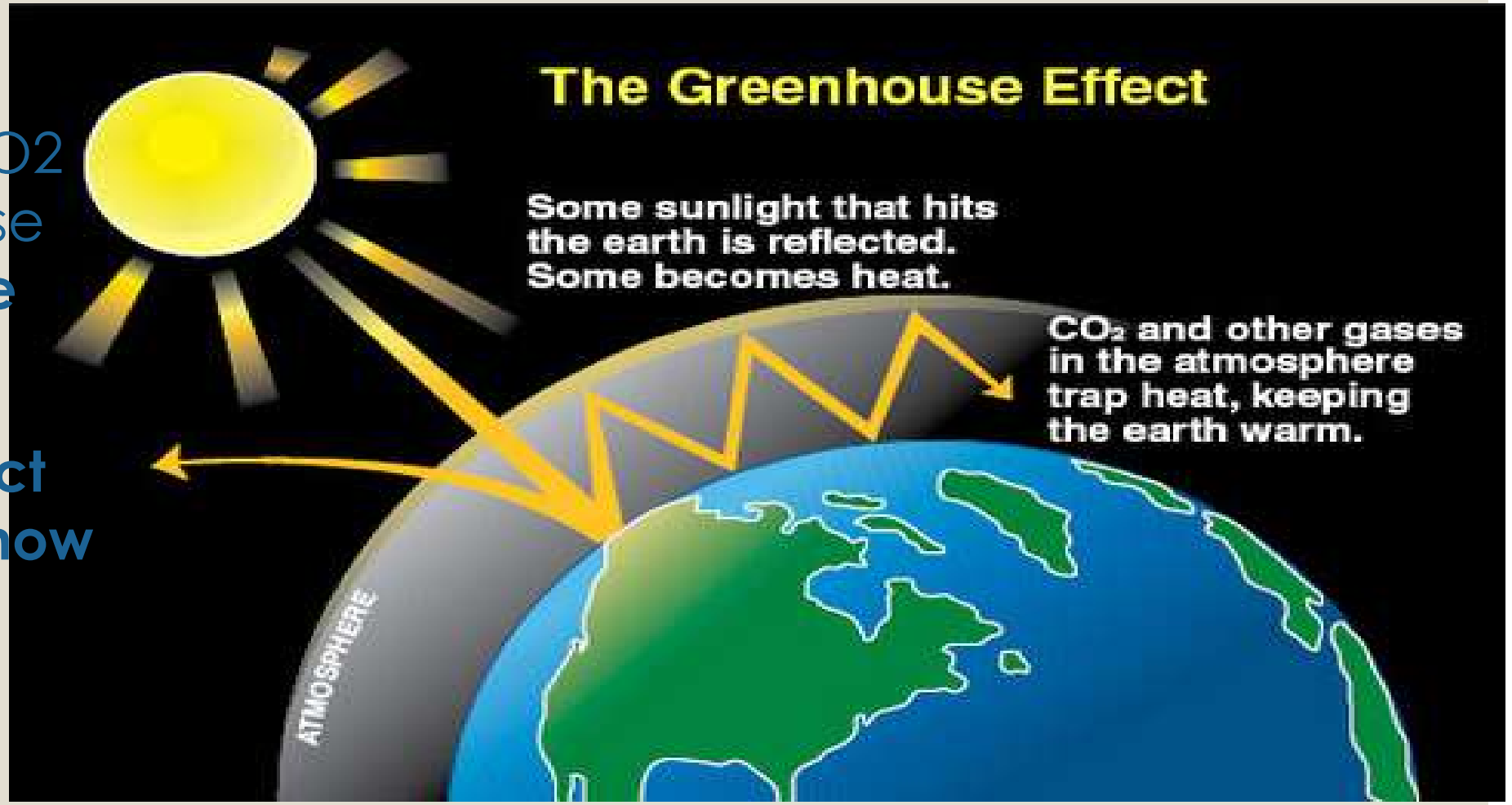
-Normally a good thing

Why is this happening?!?

-Some heat trapped/some reflected back into space

-BUT increase in CO2 & other greenhouse gases= **blanket the earth**

-**Heat cannot reflect back into space, now trapped in the atmosphere**



Hydrologic Cycle

- 1. **Water Stored in Ocean**
  - Heats up and turns from liquid to gas= **Evaporation**
    - Rise up, float into atm.= **Condensation**
    - Cools→ forms Clouds→ produces precipitation
- 2. **Precipitation**
  - Snow, Rain, Sleet, Hail, etc.
  - Particles too heavy to remain suspended= fall back to Earth
  - 1) Earth porous enough to absorb H2O
  - 2) Earth isn't porous enough= does not get absorbed
  - **(4) Runs off! =** Goes to streams or river and eventually reaches ocean
- 3. **Evapotranspiration**
  - Combo of evaporation from land & transpiration from plant life
  - H2O released back into atm.
  - Cools→ forms clouds→ produces precipitation
- 3. **Transpiration**
  - Plants release water from their leaves into atm.
  - Cools→ forms clouds→ produce precipitation

Human Activities

- **Harvesting Trees**
  - Reduces evapotranspiration→ runoff increases→ landslides/erosion/flooding
- **Paving over land surfaces to build**
  - Increases runoff and evaporation
- **Diverting water**
  - Dams

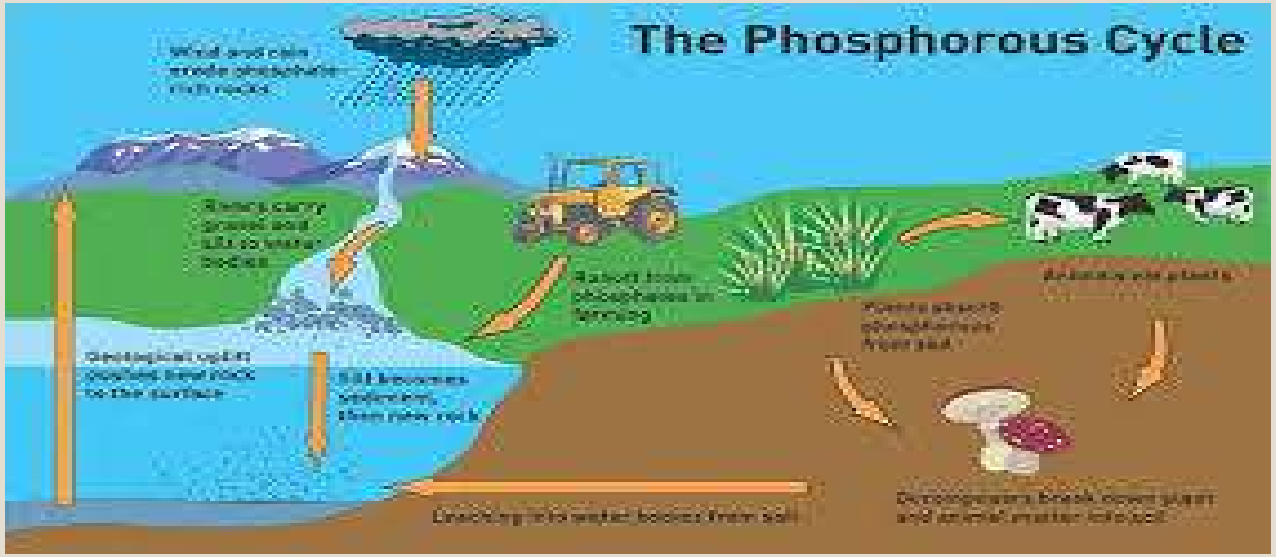
Phosphorus Cycle

- 1. Weathering or mining of phosphate rocks/ use of phosphate fertilizer
- 2. Releases phosphorus into soil and water
- 3. Producers take up phosphates
- 4. Eaten by consumers

5. Moves through food web
6. Returned to soil by decomposition or excretion

Most is found in lithosphere, hydrosphere and biosphere

Unlike carbon and nitrogen



Too Much!

- Fertilizer-containing runoff from agriculture or residential areas/household detergents
- Limiting nutrient
- Alter plant communities
- Rapid Growth of Algae= Algal Bloom
  - Eventually die= increase in decomposition=
  - Reduce dissolved oxygen= Hypoxic conditions (low oxygen)=
  - Death to fish and shellfish

Lake Erie

Chapter 6
Community Ecology

In the News…

Leaders at UN summit take steps to ensure food security for 9 billion people by 2050

Rice production in Tajikistan. Photo: FAO/Vasily Maximov

23 September 2014 – With demand for food set to increase 60 per cent by 2050, world leaders, major corporations and civil society at the United Nations Climate Summit today pledged commitments to transform agricultural practices by increasing productivity while reducing carbon emissions.

"I am glad to see action that will increase agricultural productivity, build resilience for farmers and reduce carbon emissions," said UN Secretary-General Ban Ki-moon as he opened the meeting. "These efforts will improve food and nutrition security for billions of people."

Today, at the biggest climate conference in history, more than 20 Governments, and 30 organizations and companies announced they would join the newly launched Global Alliance for Climate-Smart Agriculture, which aims to enable 500 million farmers worldwide to practice climate-smart agriculture.

Starting CH 7: Understanding Populations: 9/25

Obj. TSW learn about how populations growth rate is measured, and how graphs can represent how populations grow. P. 56NB

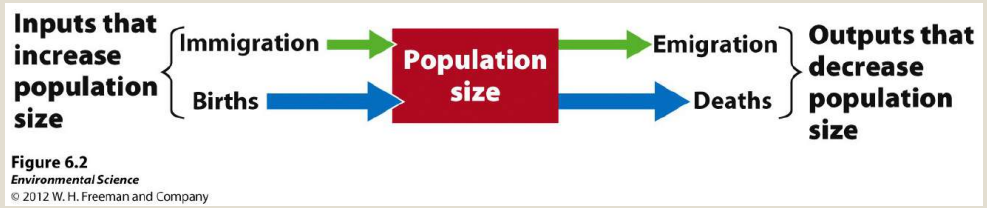


Figure 6.2
Environmental Science

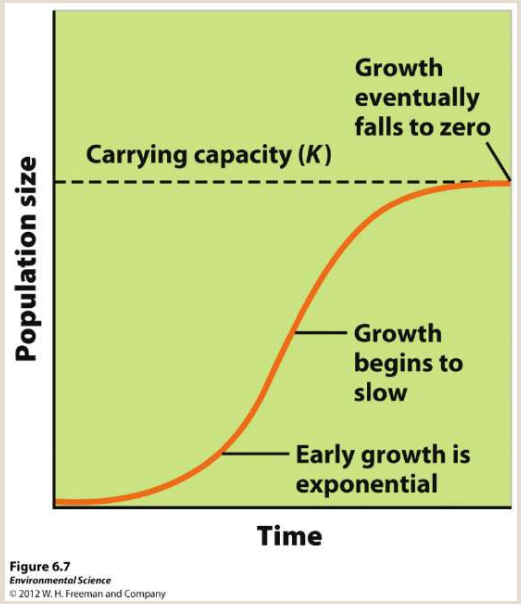


Figure 6.7
Environmental Science

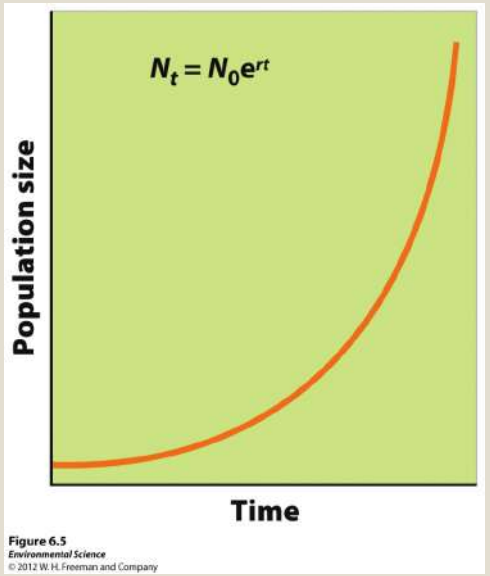


Figure 6.5
Environmental Science

1. How is Growth rate measured?
2. Draw a graph of Exponential growth, what shape is the curve and give an example of an organism with this pattern.
3. Compare and Contrast a K- selected species and a r-selected species, how are their graphs different, how are the organisms they represent different?

How do Populations change in size

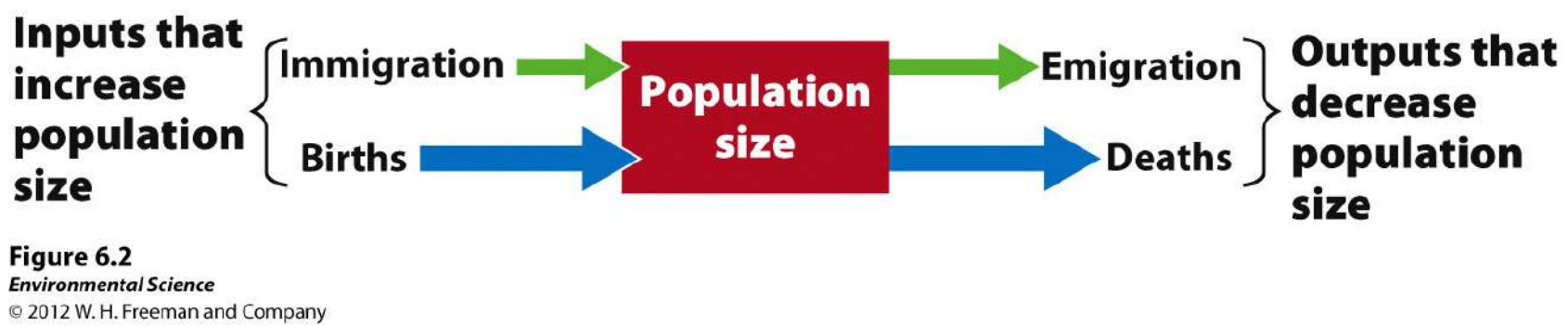


Figure 6.2
Environmental Science

- **Global Scale:** Birth rate – death rate = growth rate
  - b - d = r growth rate (r) can be + or –
- **Local Scale:** movement from one region to another
  - Immigration – # individuals entering a population
  - Emigration - # individuals leaving a population
    - r = (b – d) + (i – e)

Factors that Regulate Population Abundance and Distribution

- **Population size-** the total number of individuals within a **defined area** at a given time.
- **Population density-** the number of individuals of the same species per unit geographic area at a given time.
- **Population distribution-** how individuals are distributed with respect to one another.
- **Population sex ratio-** the ratio of males to females
- **Population age structure**- how many individuals fit into particular age categories.

Exponential Growth Model

- **Growth rate-** the number of offspring an individual can produce in a given time period, minus the deaths of the individual or offspring during the same period.
- **Intrinsic growth rate-** under ideal conditions, with unlimited resources, the maximum potential for growth.

Exponential Growth Model

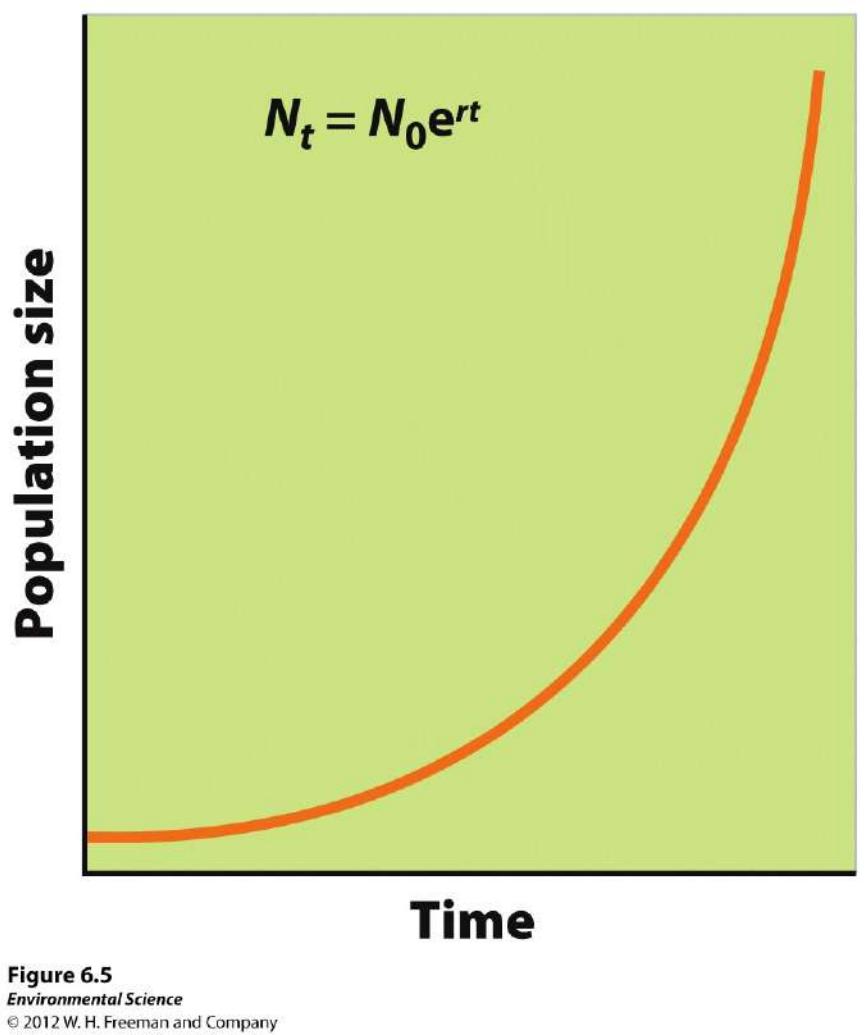


Figure 6.5
Environmental Science

- **J-shaped curve**
- Even though **Humans** are a K-Selected species, this is our current Growth rate
- Bullfrogs, Hogs

Do the Math

- What is the **% change** in the population from year 6 to year 9?

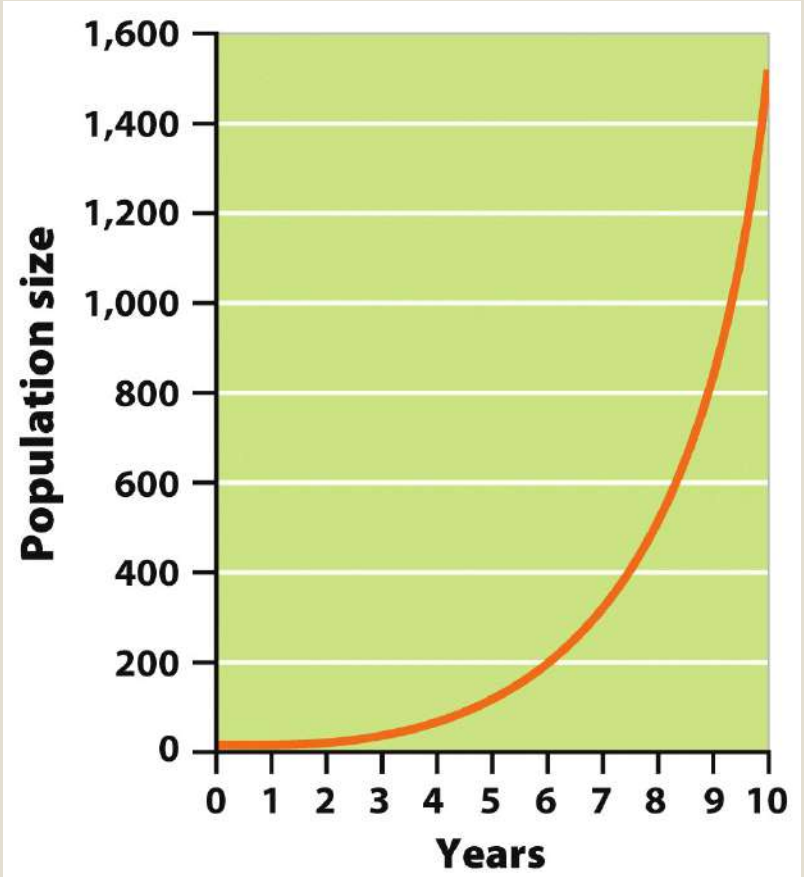


Figure 6.6
Environmental Science

Answer!

- $\frac{200 - 800}{200} \times 100\%$
- $\frac{600}{200} \times 100\% = 3 \times 100\% = 300\%$

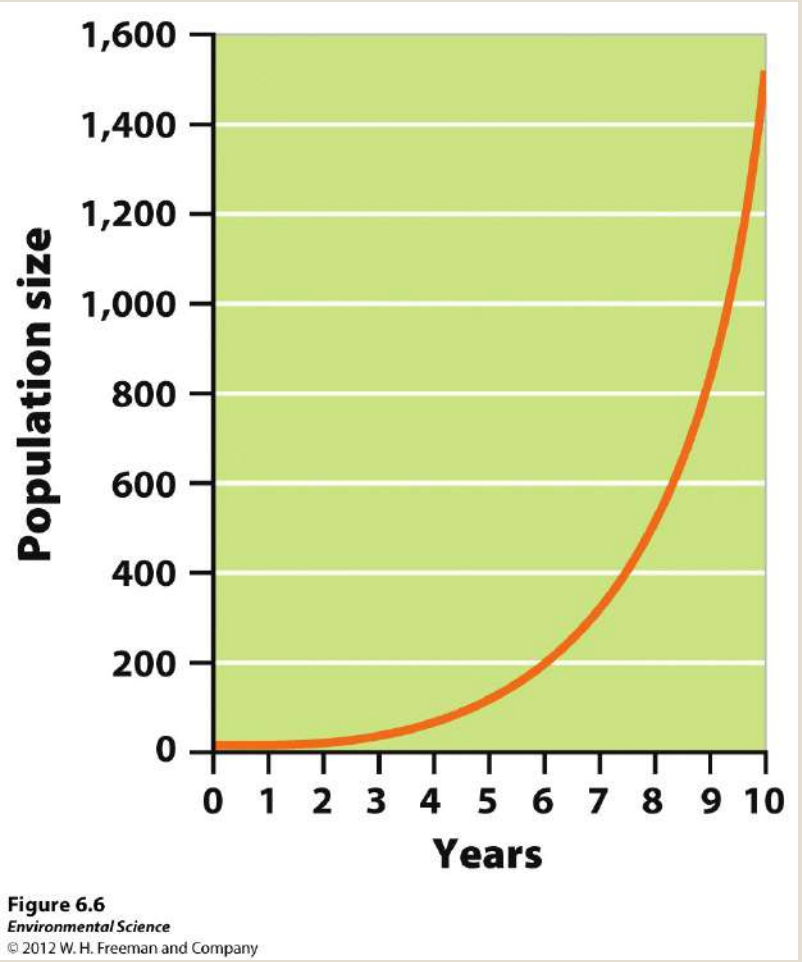


Figure 6.6
Environmental Science

Reproductive Strategies

- **K-selected species-** the population of a species that grows slowly until it reaches the carrying capacity.

Ex. elephants, whales, and humans*.

- **R-selected species-** the population of a species that grows quickly and is often followed by overshoots and die-offs.

Ex. mosquitoes and dandelions

Logistic Growth Model

- Logistic growth- when a population whose growth is initially exponential, but slows as the population approaches the carrying capacity.
- S-shaped curve- when graphed the logistic growth model produces an "S".
- Usually "K" selected species.

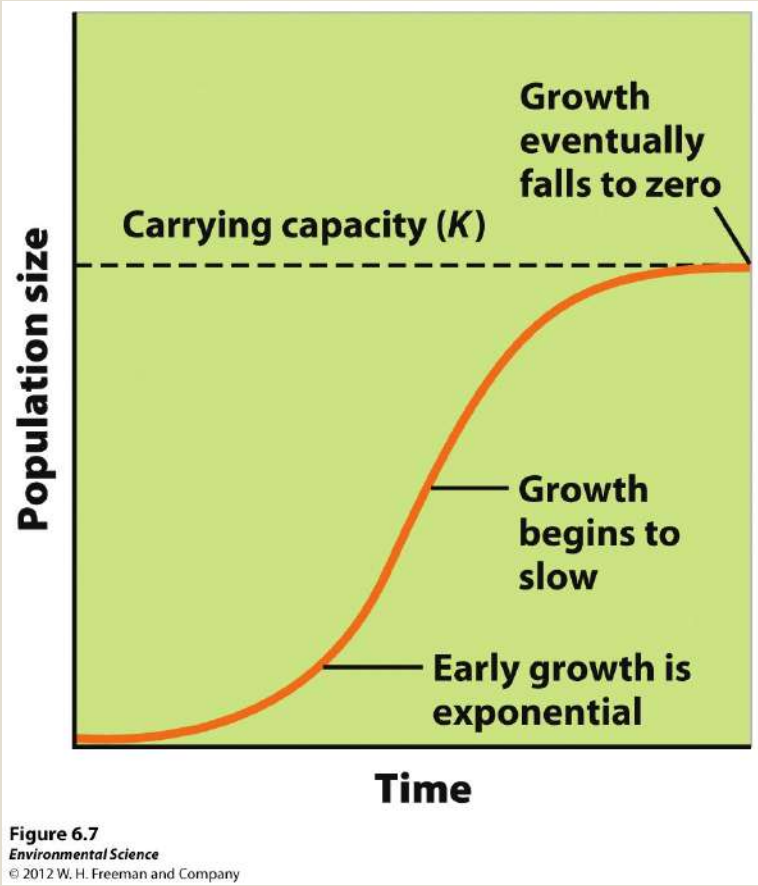


Figure 6.7
Environmental Science

Growth and decline of Reindeer population

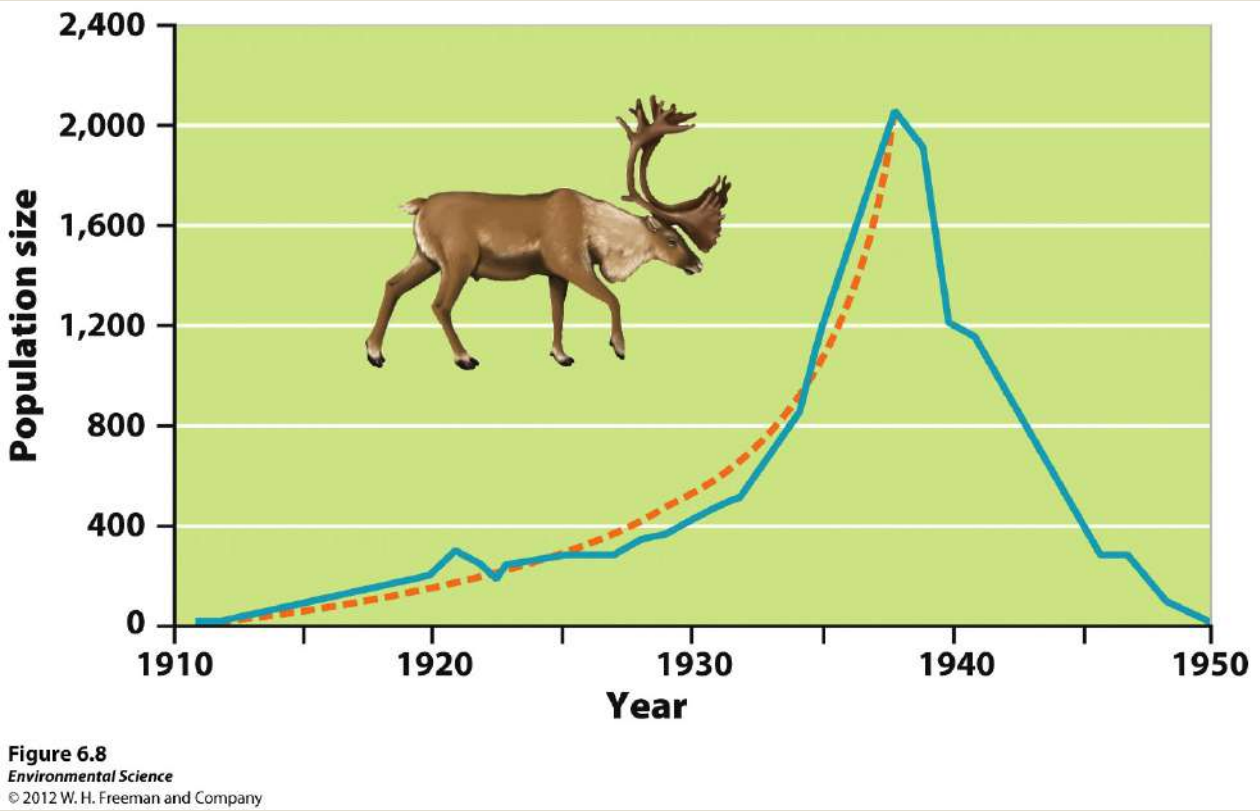


Figure 6.8
Environmental Science

25 Reindeer were introduced to St. Paul Alaska in 1910.

- What Growth pattern does it show?
- Why did the population crash?

- If food becomes scarce, the population will experience an overshoot by becoming larger than the spring carrying capacity and will result in a die-off, or population crash.

Variations of the Logistic Model

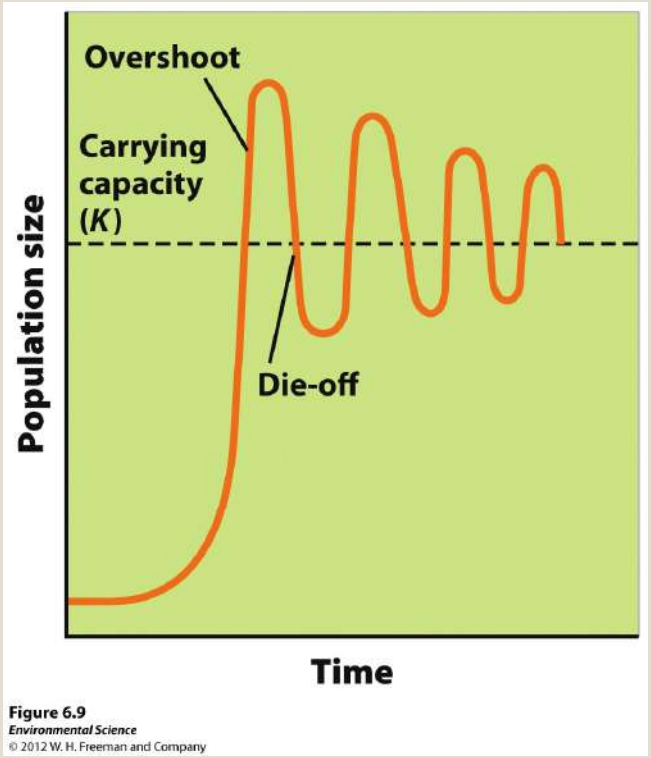


Figure 6.9
Environmental Science

TABLE 6.1 Traits of *K*-selected and *r*-selected species

Trait	*K*-selected species	*r*-selected species
Life span	Long	Short
Time to reproductive maturity	Long	Short
Number of reproductive events	Few	Many
Number of offspring	Few	Many
Size of offspring	Large	Small
Parental care	Present	Absent
Population growth rate	Slow	Fast
Population regulation independent	Density dependent	Density
Population dynamics	Stable, near carrying capacity	Highly variable

Table 6.1
Environmental Science

K- selected vs. r-selected

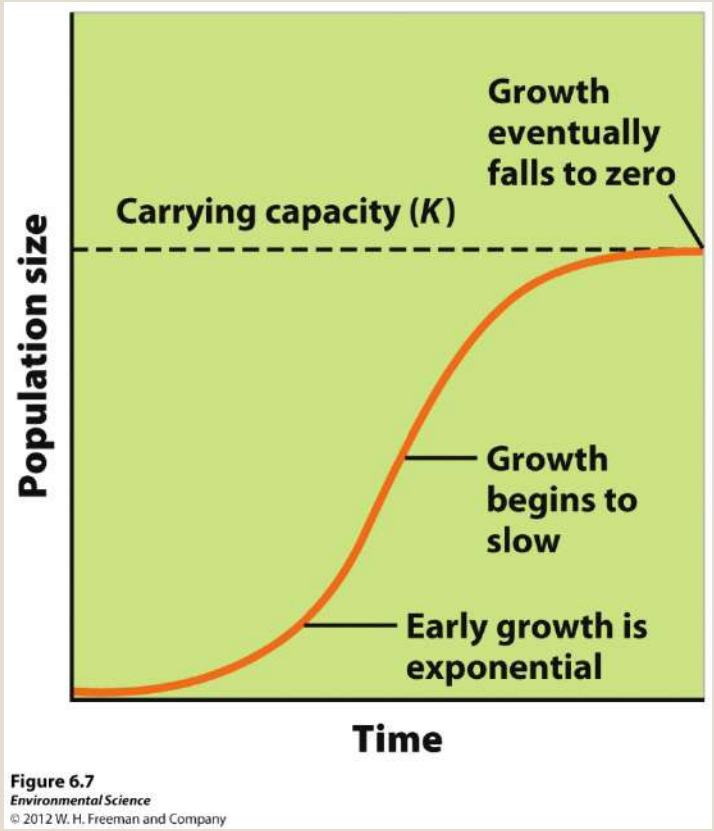
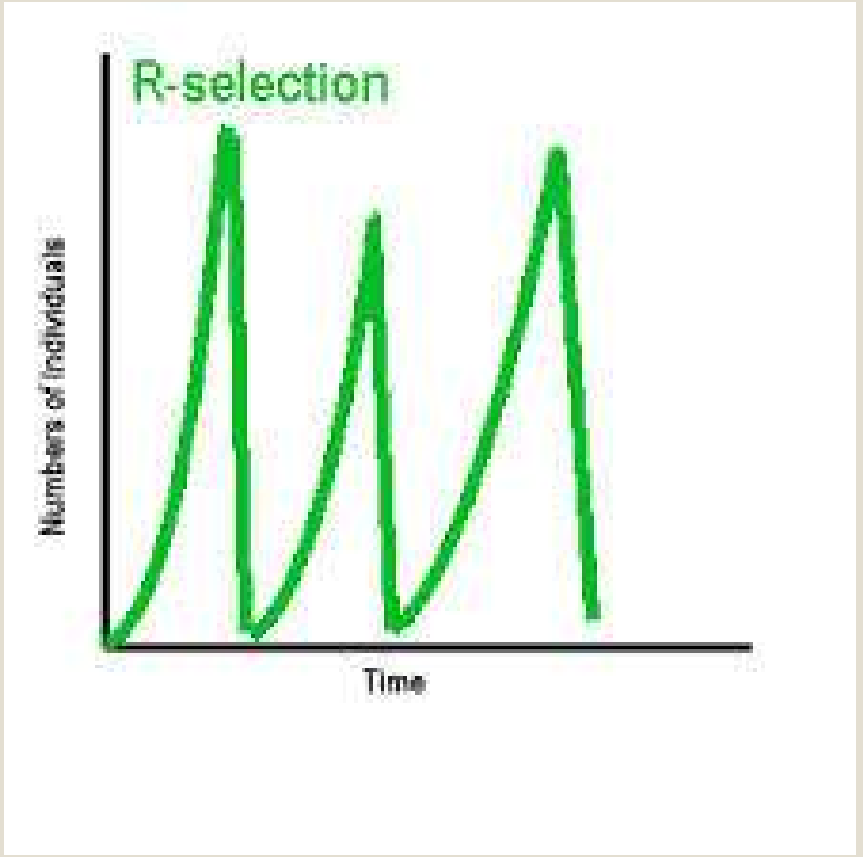


Figure 6.7
Environmental Science



Survivorship Curves

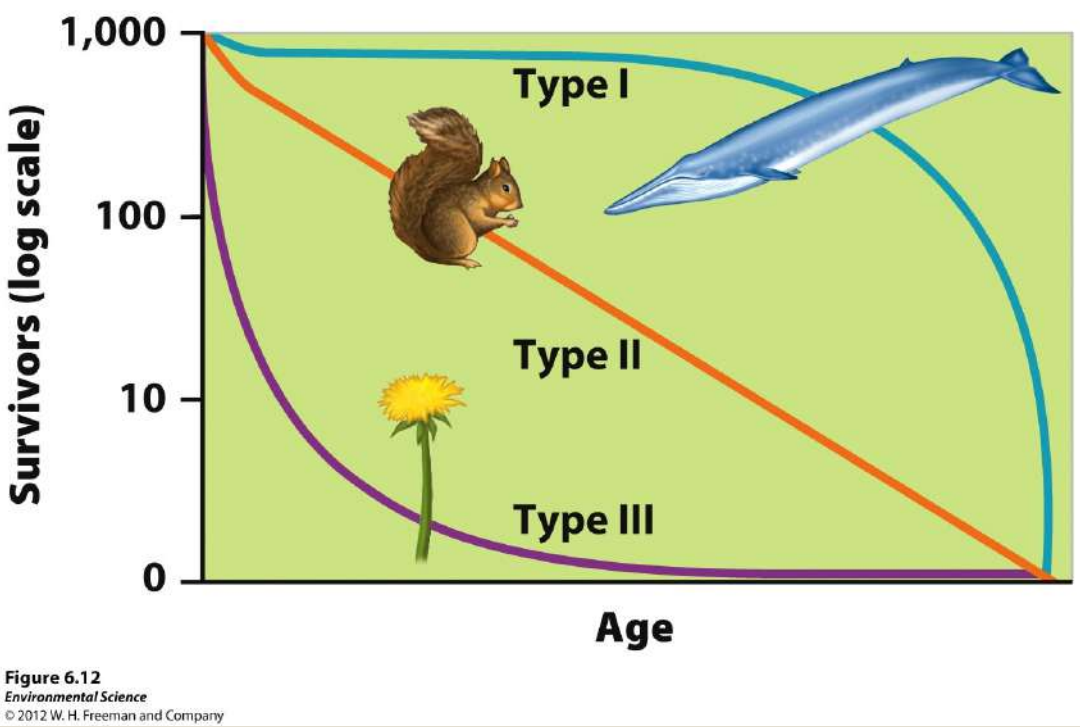


Figure 6.12
Environmental Science

Type I survivorship – Has excellent survivorship until old age. **K – selected species.**

Type II survivorship – Exhibiting a relatively constant decline in survivorship over time.

Type III survivorship – Has low rates of survivorship early in life. **r-selected species**

Eutrophication 9/26

Obj. TSW identify why nitrogen-based fertilizers are heavily used in industrial practices and effects of run-off from agricultural land pg. 58

- 1. Explain Eutrophication and give an example of how it can happen
- 2. What effect does Eutrophication have on organisms in a body of water?
- 3. What role did the "Green Revolution" play on the industrialization of farming practices using Nitrogen?