

## Population Ecology 3

### Logistic Growth and Human Demographics

#### I. Logistic Growth (Chap. 11, continued)

- A. Patterns: Sigmoidal curve
- B. Equation
- C. What limits population growth?
  - Density dependent factors
  - Density independent factors

#### II. Human demographics

- A. Distribution
- B. Growth rates and carrying capacity
- C. Age Structure

### Bottom line of exponential growth:

When there are no limits, populations grow faster,  
and **FASTER**  
and ***FASTER!***

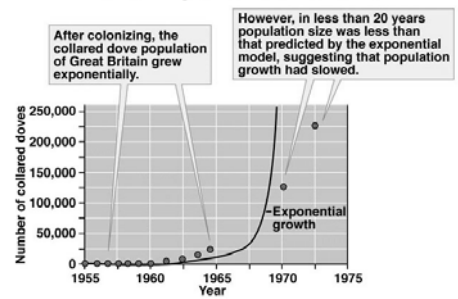
What happens if there are limits?  
(And eventually there ALWAYS are!)

### LOGISTIC POPULATION GROWTH

#### A. Patterns

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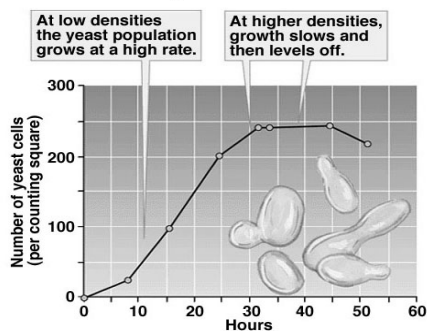
#### Dove Exponential Growth



11.6

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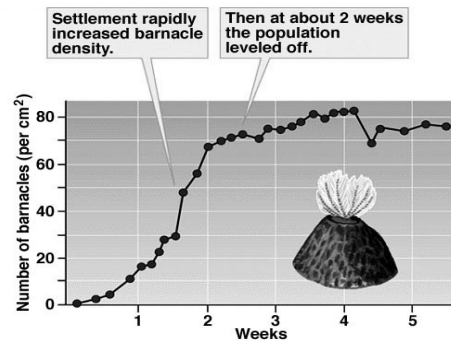
#### Yeast Sigmoidal Growth



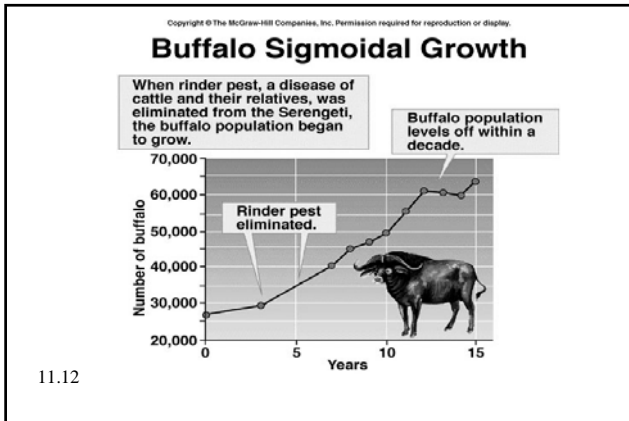
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#### Barnacle Settlement



11.11



The sigmoidal curve defines the shape of logistic growth.

Draw it.

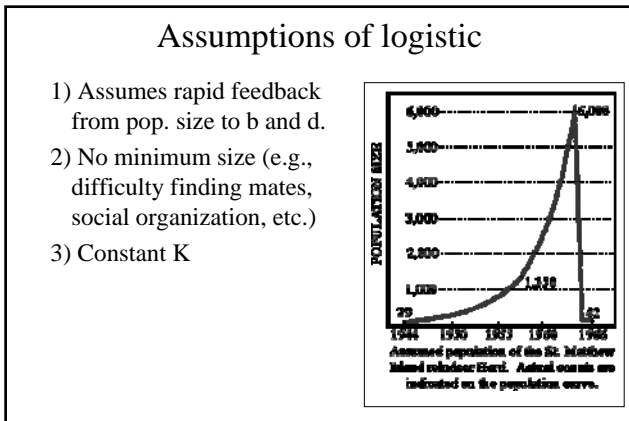
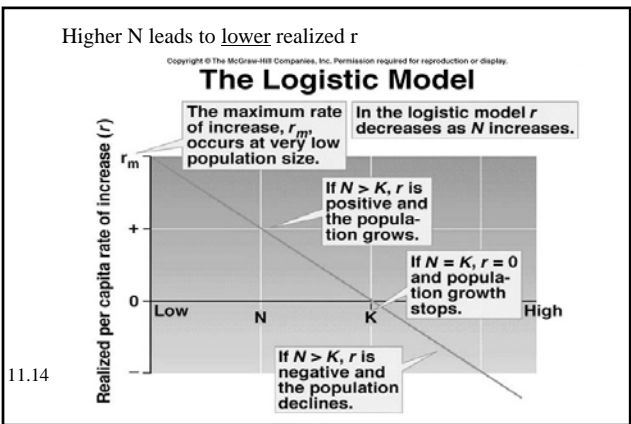
What are the axes?

What is  $r$ ? Is it constant or changing?

Where is  $r$  at its maximum?

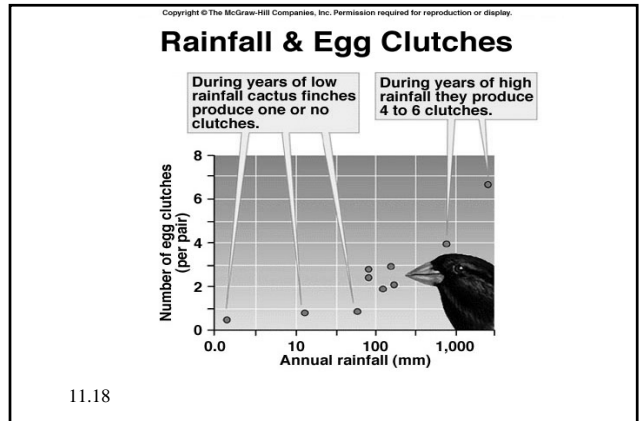
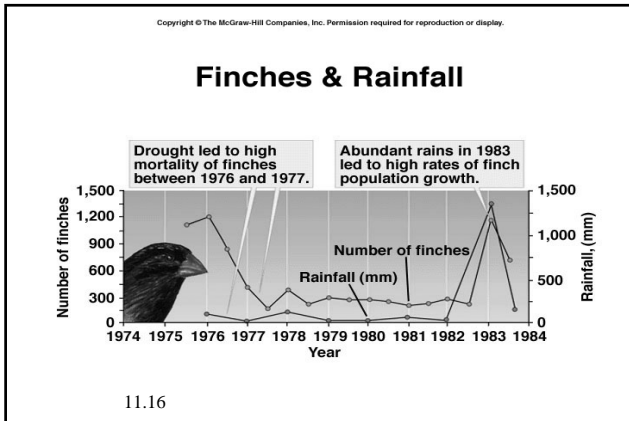
Where is  $dN/dt$  at its maximum?

B. The equation



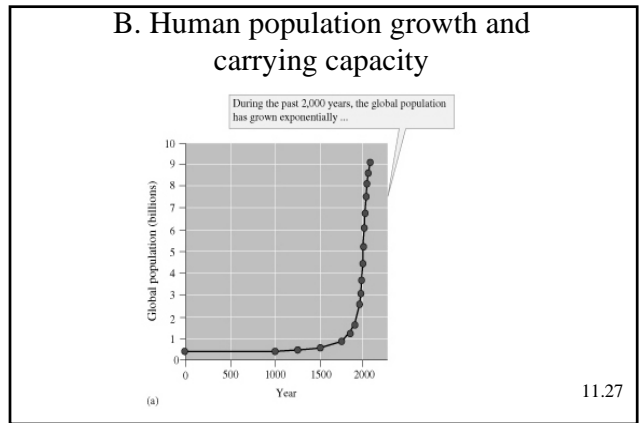
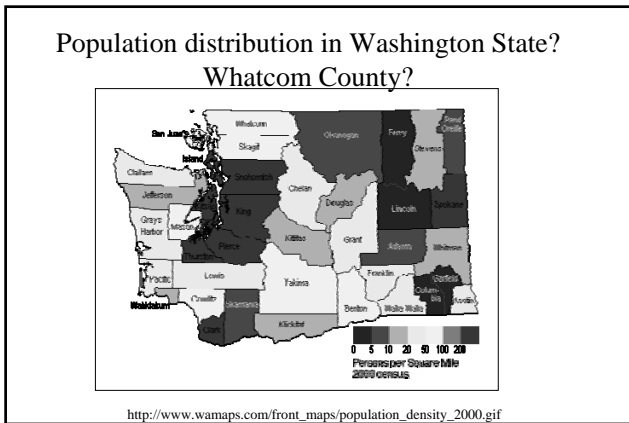
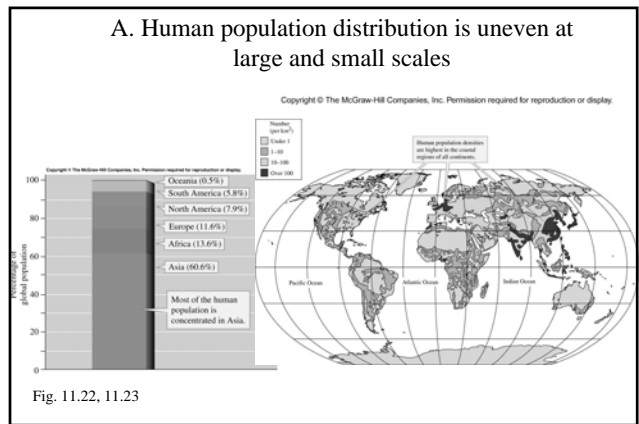
### C. What limits population growth?

1. Density dependent factors
2. Density independent factors

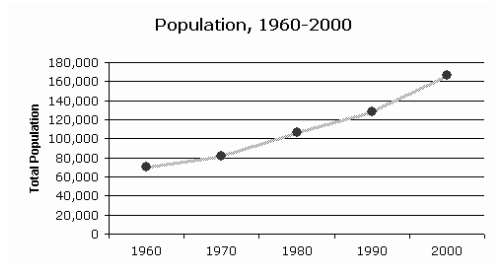


## II. Human demographics

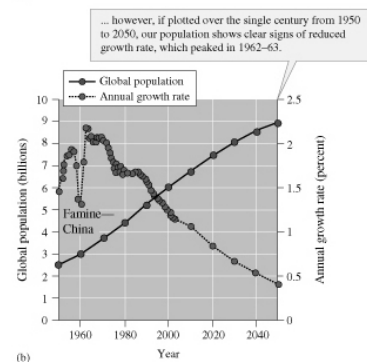
- A. Distribution
- B. Growth rates and carrying capacity
- C. Age structure



## Whatcom County population growth: just birth and death rates?

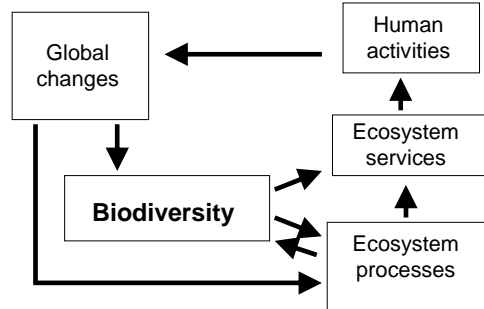


[http://www.censusscope.org/us/s53/c73/chart\\_popl.html](http://www.censusscope.org/us/s53/c73/chart_popl.html)



## What is carrying capacity of planet?

## Human activities affect resource availability



## K depends on human impact

Depends on

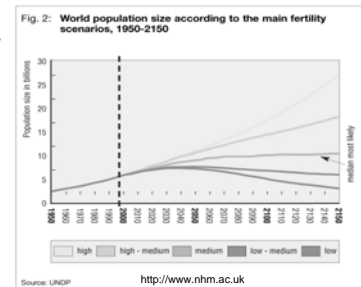
- Total human population
- Consumption by each individual
- Ecological impact of each unit of consumption

$I = PAT$  (Ehrlich and Ehrlich)

- P = population
- A = affluence
- T = technology

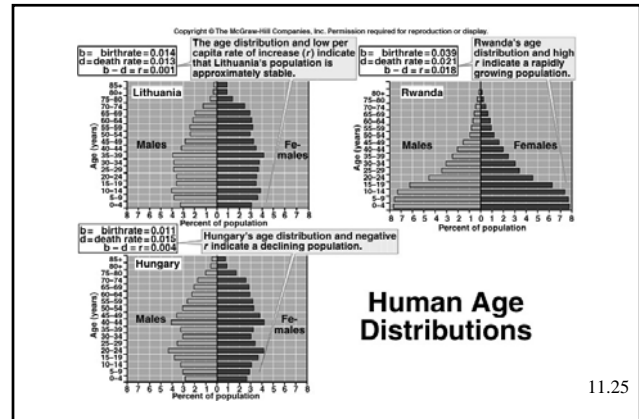
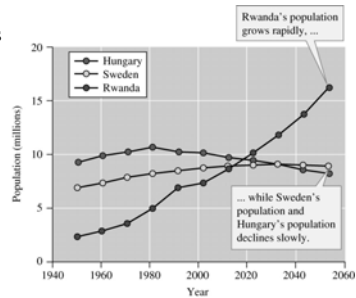
## How is population likely to grow in the future?

C. Age structure entrains population growth rates based on per capita birth and death rates



## How is population likely to grow in the future?

C. Age structure entrains population growth rates based on per capita birth and death rates



11.25

## Summary

1. Logistic growth incorporates density-dependent population regulation.
2. Realized  $r$  is greatest at low population size, whereas  $dN/dt$  is greatest at  $K/2$ .
3. Human population distribution is uneven.
4. Human  $K$  is unknown.
5. Age structure influences future population growth rates.