

## Impacting earth's systems

- How humans have impacted the systems occurring on earth
  - Intentional
    - Clearing land for human use
  - Unintended
    - Accidental
    - Uninformed

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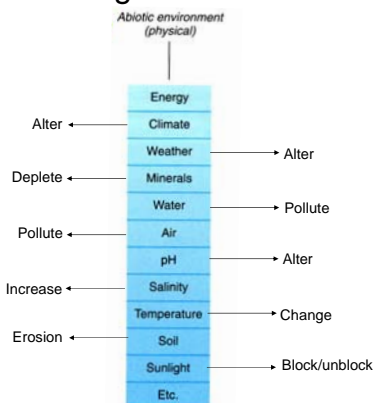
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## Altering abiotic factors




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## Alter biotic components

- Alter or destroy a habitat or ecosystem

North American Ecosystem	Percent lost
Tallgrass prairie	99% transformed
Primary forest	95% lost
Pacific NW old growth forest	90% cleared
Wild or scenic rivers in US	90-98% degraded
Original wetlands	50%+ drained & filled

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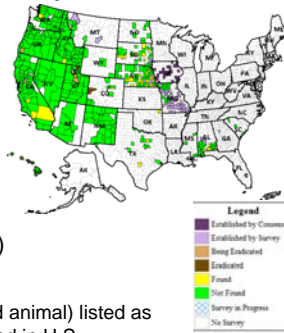
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## Alter biotic components

- Introduce species
  - Wild boar (1500s)
  - Killer bees (1990)
  - Zebra mussel (1988)
  - Kudzu (1876)
  - Fire ant (1930s)
  - Japanese beetle (1916)
- Eliminate species

- 1,231 species (plant and animal) listed as endangered or threatened in U.S.




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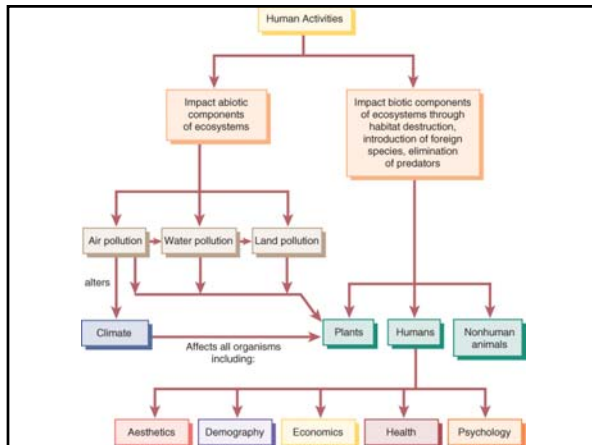
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## Evolution of human society

- Should not *assume*
  - That earlier societies did not change the environment
  - Those societies who worked the land had a better understanding of the environment
  - That everything we do today is harming the environment

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## Hunting and gathering societies

- Live as nomads or had semi permanent lifestyles
- Had “little” impact on environment
- Small population
- Understood dependence on environment and respect for it

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## Hunting and gathering societies

- Did cause change:
  - May have led to extinction of post-ice age species
    - Giant sloth, mammoth, saber-toothed tiger, giant beaver
  - Evidence of over-hunting of bison by Great Plains peoples



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## Agricultural Societies

- Semi permanent lifestyle with domesticated animals
- Subsistence farming until advent of wooden plow
  - Increased food production
  - Greater control of life
- Ability to grow food beyond own needs freed some to do other things
  - Growth of towns/cities

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## Agricultural Societies

- Growth of cities demanded more resources
- Overgrazed lands
- Poor land management
  - Soil erosion
  - Forest destruction
  - Decreased land productivity
  - Loss of connection to environment

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## Industrial Society

- Shift to large scale machine work , i.e. Industrial Revolution
- Technological and engineering advances - Internal combustion engine, cast-iron plow, coal-powered machines
  - Less labor, more energy
  - Higher productivity
- Lower death rate, better access to food, longer lives

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## Industrial Society

- Large amounts of water and air pollution
- Greater demands on natural resources as population increased
- Further separation from nature and the environment
  - “The negation of nature is the way towards happiness” Locke

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## Advanced Industrial Age

- Started post World War II
- Production and consumption
  - Huge increase in energy
  - Greater prosperity
- Advances in medicine, technology
  - Better living conditions
  - Lower death rates



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## Advanced Industrial Age

- Shift towards synthetics and non-renewable resources
  - Greater dependence on fossil fuels
  - Air and water pollution
- Disruption of ecosystems
- Disposability and convenience mentality
- Better life?

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## Why populations matters

- Population of everything matters:
  - Plants
  - Animals
  - And humans
- Addition of more things alters the environment
  - More plants – take up more CO<sub>2</sub>
  - More animals – eat more plants
  - More people – eat more plants and animals, use more O<sub>2</sub>

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## How long do you want to live?

Year	Average	Male	Female
<b>1930</b>	59.7	58.1	61.6
<b>1940</b>	62.9	60.8	65.2
<b>1950</b>	68.2	65.6	71.1
<b>1960</b>	69.7	66.6	73.1
<b>1970</b>	70.8	67.1	74.1
<b>1980</b>	73.7	70.0	77.4
<b>1990</b>	75.4	71.8	78.8
<b>2000</b>	77.0	74.3	79.7

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## Tragedy of the Commons

- “The population problem”
- National parks – loved to death?
- Legislate temperance
- Universal Declaration of Human Rights

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## Tragedy of the Commons

- “...there is no prosperous population in the world today that has, and has had for some time, a growth rate of zero.”
- “...by any reasonable standards, the most rapidly growing populations on earth today are (in general) the most miserable.”

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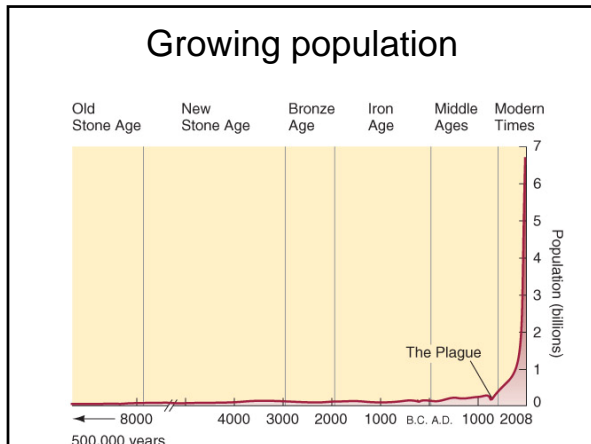
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- ### Why is the population growing?
- Better access to health care for mothers and children
  - Medical advances – for young and old
  - Stable food sources
  - Warfare?
  - ?

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- ### Population
- Birthrate (BR) – number of individuals born per 1000 individuals per year
  - Death rate (DR) – number of people who die per 1000 individuals per year
  - $BR = DR$  – no change in population
  - $BR > DR$  – population increases
  - $BR < DR$  – population decreases

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## Population growth

- Population growth rate – percentage of total population
- Example:
  - 14 births/1000
  - 8 deaths/1000
  - $14 - 8 = 6$
  - Population growth of 0.6 (6/1000)

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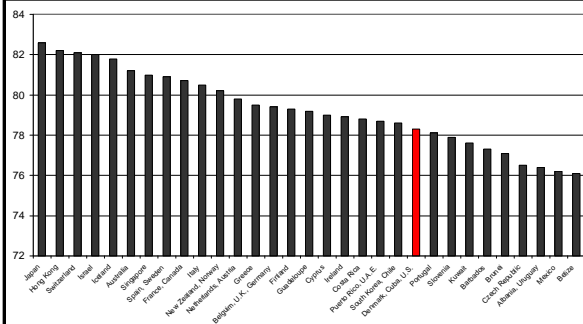
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## Life Expectancy by Country



## What can affect life expectancy?

- Living conditions
- Health of mother
- Environmental factors
- Economic status
- Genetics
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## World growth rate

- Growth rate =  $(\text{Crude birth rate}/1000 \text{ people} - \text{Crude death rate}/1000 \text{ people}) \times 100\%$
- World growth rate =  $(21/1000 - 9/1000) \times 100\% = 1.2\%$

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**Growth Rate and Doubling Time**

Region	Growth Rate(%)	Doubling Time (years)*
World	1.2	58
More Developed Countries	0.1	700
Less Developed Countries	1.5	47
Africa	2.5	28
Asia	1.2	58
North America	0.6	117
Latin America	1.5	47
Europe	-0.1	—
Oceania	1.0	70

\*Discrepancies in doubling time are the result of rounding off growth rates.

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## Birth rate

- Age at time of marriage
- Education level
- Working status of woman after marriage
- Contraceptive use
- Number of children desired
- Cultural values
- Religious beliefs

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## Death rate

- Medical access
- Sanitation
- Food supplies
- Economic status
- Political stability

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## Replacement level

- Total replacement level (TRL) is 2.1 in developed nations
  - 10 women must have 21 children to replace themselves and their partners
  - Rate is higher in less developed nations
- 82 out of 200 nations at or below TRL



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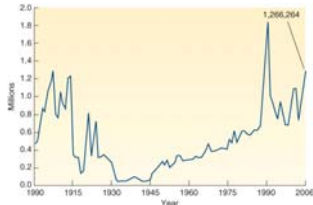
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## Population growth

- Consider birth and death rates
- U.S. TRL is stable but population still growing
  - Immigration
    - Emigration for other countries
  - Lag time



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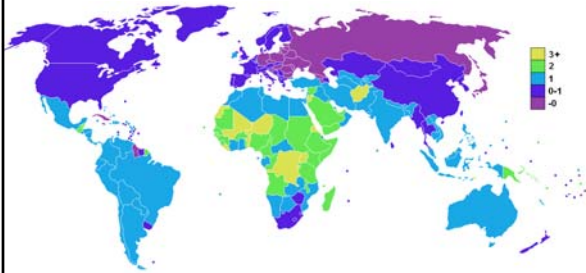
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## Population growth rate



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## Population growth rate

- Liberia: 4.5%
- U.S.: 0.97%
- Italy: 0.13%
- Japan: -0.02%
- Germany: -0.07%

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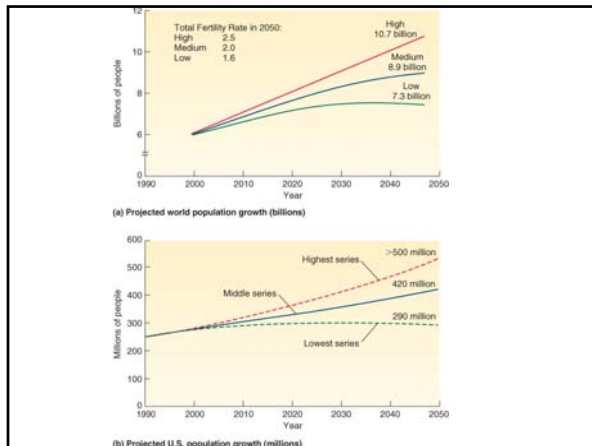
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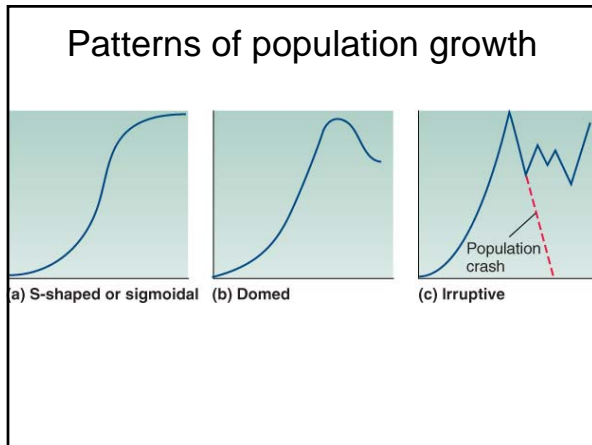
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