Ecology is Lecture 17

- 4 questions from Lecture 17 will be on your final for this course
- Review material for Lecture 17 is listed in the Assignments section of my website.
Ecology = Interactions of organisms with their environment and with other organisms
Ecosystem = living (biotic) and nonliving components (abiotic) in a defined area.
Lakes and rivers

Marine tide pools

Rain Forest

Desert

Ecosystem examples
ECOSYSTEM Structure

Biotic (living) components

Abiotic (nonliving components)
Soil Texture

Soil Nutrients

Soil Water

Soil Air (O₂, CO₂, N₂, CH₄)

Soil pH

Soil Temperature

Soil Ecosystem - the abiotic components
Fungi

Bacteria

Nematodes

Arthropods

Annelids

Soil Ecosystem - the biotic components
Biotic

Abiotic

BIOGEOCHEMICAL CYCLES

C

N

P
In 2009 the world will burn:

31 billion barrels of oil
6 billion tons of coal
100 trillion cubic feet of natural gas

This burning will produce 30 billion tons of excess carbon dioxide – CO$_2$
This burning will produce 30 billion tons of excess carbon dioxide – CO₂
Greenhouse: Light penetrates glass but heat is trapped by glass
Greenhouse gases such as carbon dioxide \((CO_2)\) trap reflected heat.
Atmospheric Carbon Dioxide Concentration and Temperature Change

CO₂ CONCENTRATION (Antarctic Ice Core)

Current Level

Level 1800AD

Temperature change (°C)

Temperature change (°C)

Thousands of years ago

Carbon dioxide (ppmv)

200

250

300
Rising levels of CO$_2$ appears to correspond to changes in world temperature.

But is rising level of CO$_2$ the cause of the increasing temperature?
Does greenhouse effect melt glaciers?
Glacier in Andes is shrinking at a rate of 509 feet per year
Average CO₂ production per person per year (U.S.)

<table>
<thead>
<tr>
<th>Category</th>
<th>CO₂ Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total CO₂</td>
<td>20.23 tons</td>
</tr>
<tr>
<td>Transport</td>
<td>9.54 tons</td>
</tr>
<tr>
<td>Energy</td>
<td>3.99 tons</td>
</tr>
<tr>
<td>Waste</td>
<td>3.92 tons</td>
</tr>
<tr>
<td>Food</td>
<td>2.78 tons</td>
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</tbody>
</table>
Nitrogen (N) fertilizer applied to crops influences the nitrogen cycle.
Production of Nitrogen fertilizers in millions of tons of nitrogen.
Livestock such as cattle and pigs produce excess Nitrogen (N) in their waste which finds its way into rivers.
Excess nitrogen from farming collects in the Mississippi to Gulf of Mexico.

Nitrogen causes algae blooms which deplete oxygen when algae die.

Dead zone
Underground aquifers are repositories of 20% of all fresh water.
Nitrates move through soil and contaminates aquifers.
Nitrate ($\text{NO}_3^-$) and nitrite ($\text{NO}_2^-$) problem

Nitrate Fertilizer in soil  $\rightarrow$ Nitrate in crop plants  $\rightarrow$ Nitrite formation in animals

Nitrite Health issues
- Forms methemoglobin (no Oxygen)
- Nitrite + amine (NH$_2$) = nitrosamine = cancer??
- Can antioxidants (veggies) neutralize effect of nitrite??
Producers (Photosynthesis)

Primary consumers

Secondary consumers

Tertiary consumers

Quaternary consumers

Decomposers

Trophic (feeding) levels
Only 10% of energy and biomass is transferred to the next trophic level.

Producers 100,000 lbs

Primary consumer – 10,000 lbs

Secondary consumer – 1000 lbs

Tertiary consumer – 100 lbs

Quaternary consumer 10 lbs
Food chain magnifies PCBs

PCB cause cancer and disruption of reproduction

Phytoplankton: 0.025 ppm
Zooplankton: 0.123 ppm
Small fish: 1.04 ppm
Larger fish: 4.83 ppm
Birds: 124 ppm

Polychlorinated biphenyl
World population

- 1800 = 1 billion
- 1930 = 2 billion
- 1975 = 4 billion
Earth’s biomes – ecosystems dominated by specific types of vegetation and governed by climate
Chaparral burns every few years as plants get woodier and oils accumulate in the leaves.
Ash becomes fertilizer for plant growth
Immediately after fire

Same area 2 years after fire
After a fire, wildflower seeds germinate

After fire the burned stumps sprout new greenery.