ENVIRONMENT SCIENCE

ECOLOGY

WHAT IS ENVIRONMENT

- **Environment** means all of the outside forces, events and things that act on a thing.

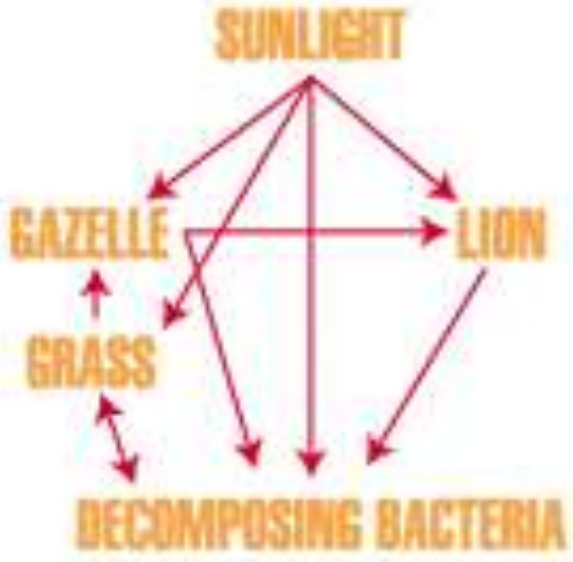
- A person's environment is made up of everything that surrounds him or her, including houses, buildings, people, animals, land, temperature, water, light, and other living and non-living things.

IS ENVIRONMENT SO IMPORTANT- Yes it is as _ _

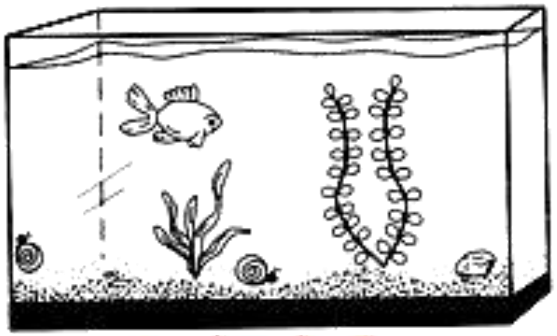
- Living things do not simply exist in their environment. They constantly interact with it. Organisms change in response to conditions in their environment.
- The environment consists of the interactions among plants, animals soil, water, temperature, light, and other living and non-living things.

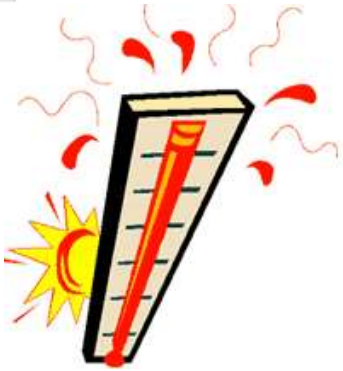
Ecology

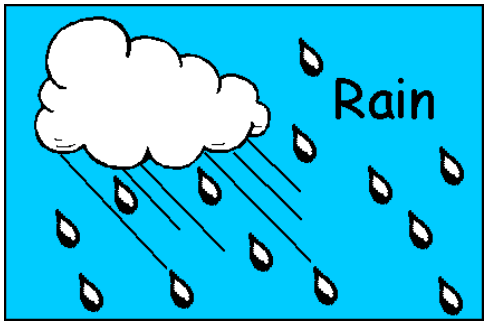
- Study of interactions that occur among organisms and their Physical Environment



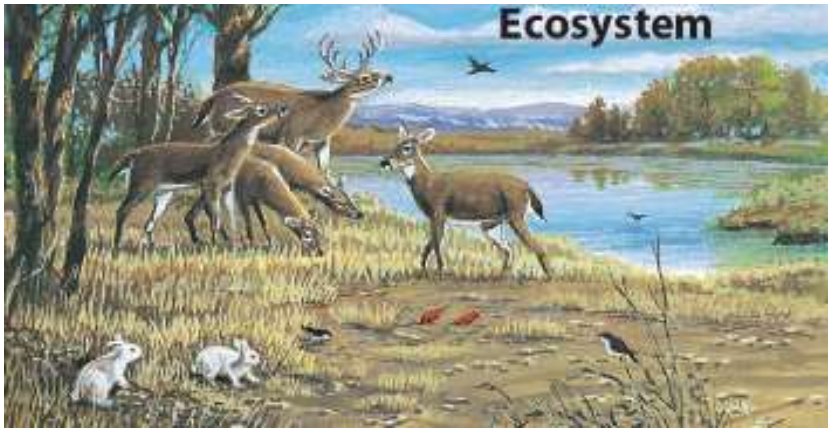
Ecosystem

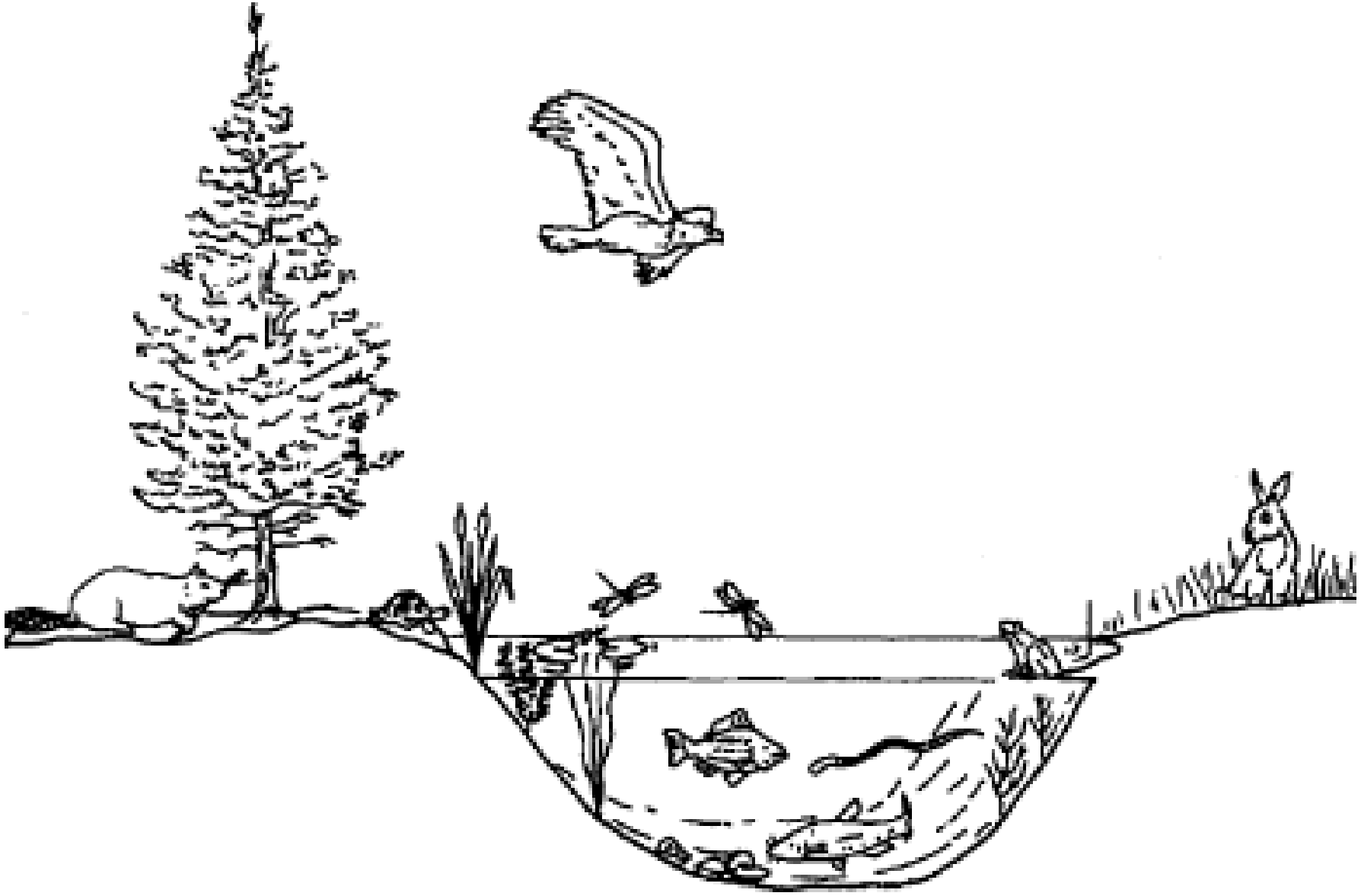


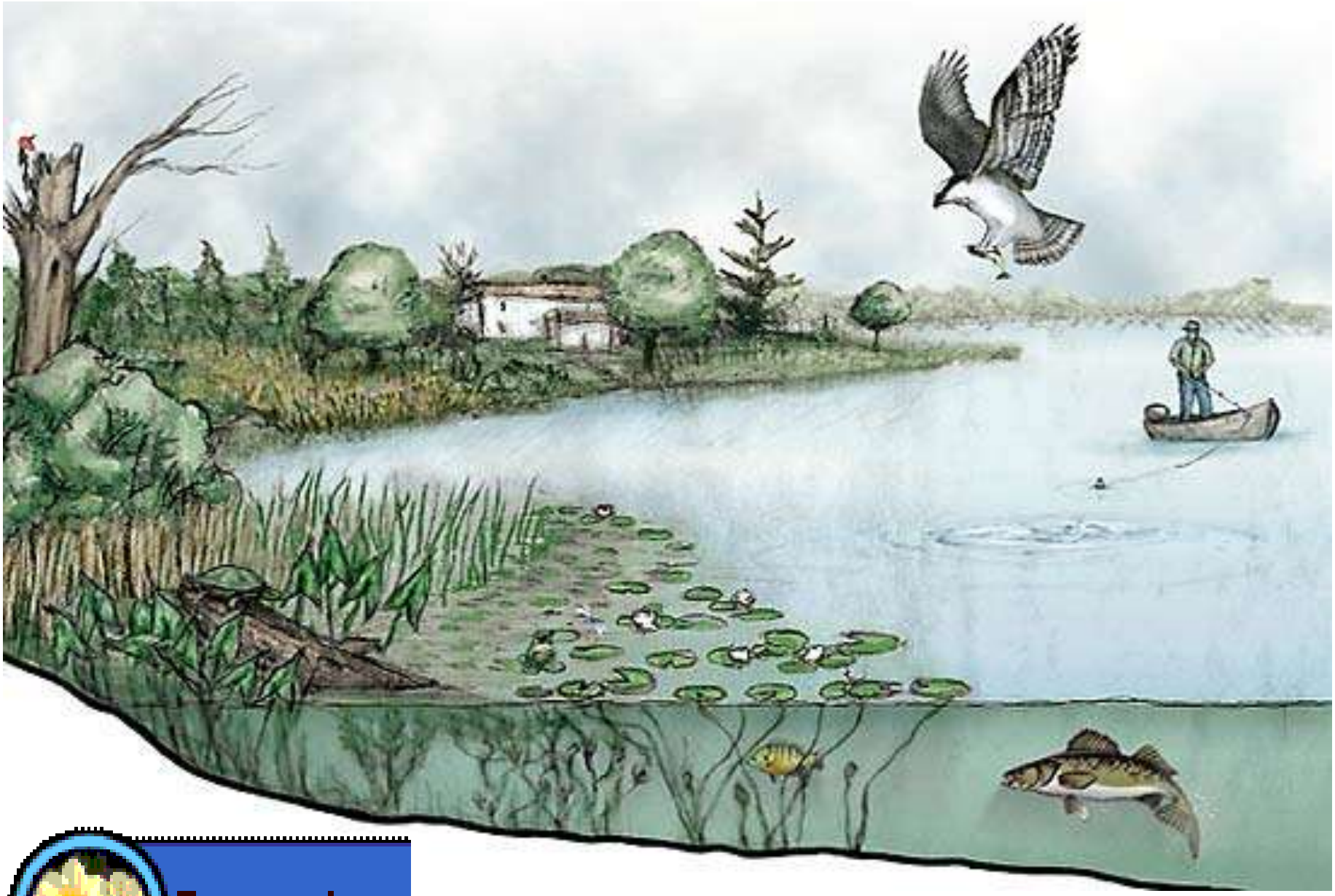




- All living & nonliving things in environment
- Biotic factors = living
- Abiotic = nonliving

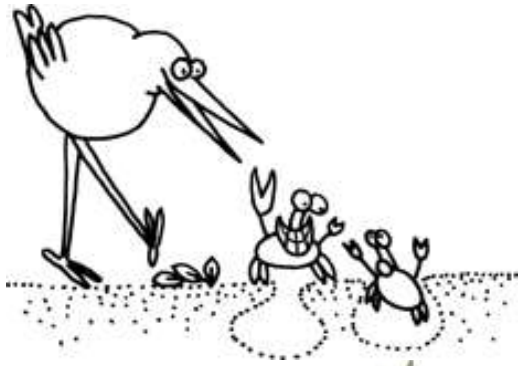


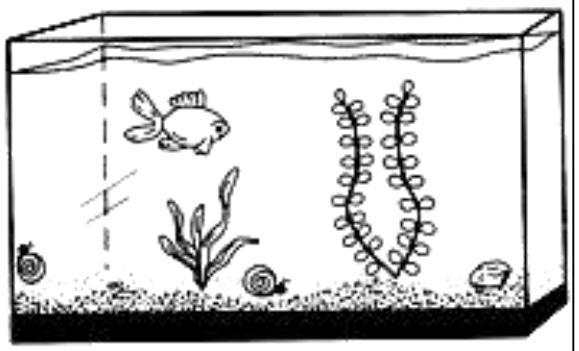




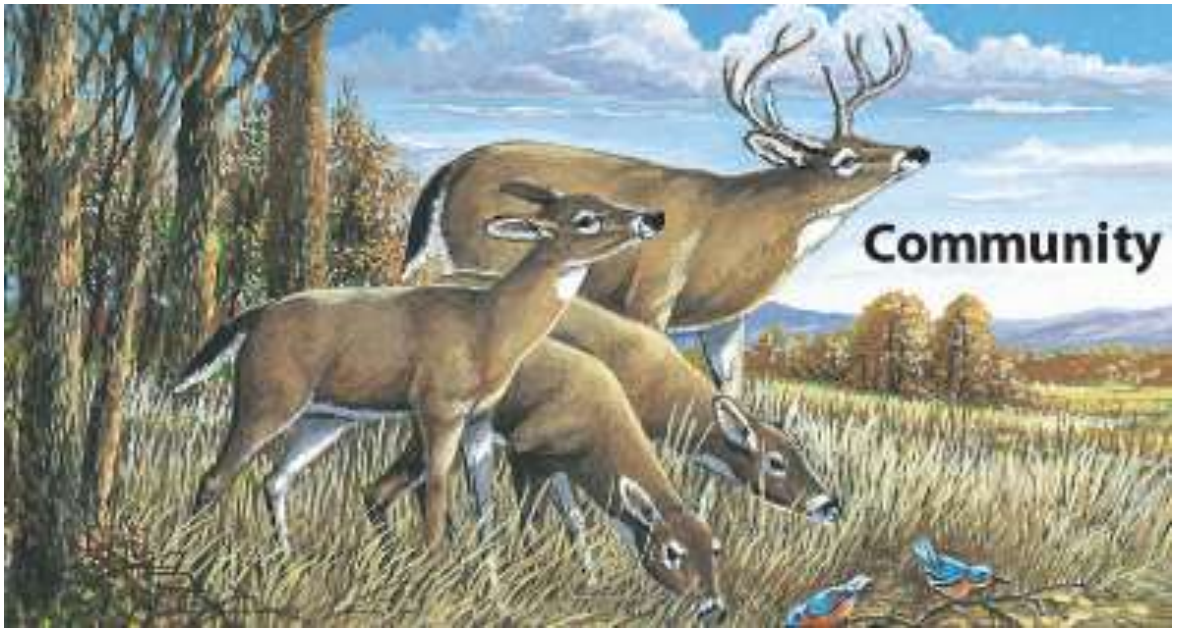
Ecosystem

Community



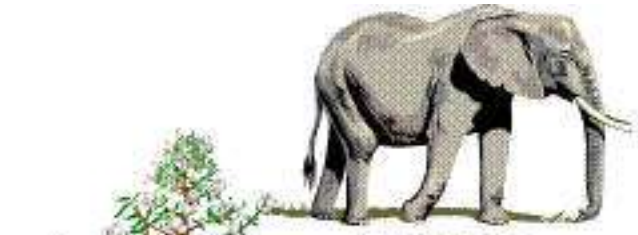


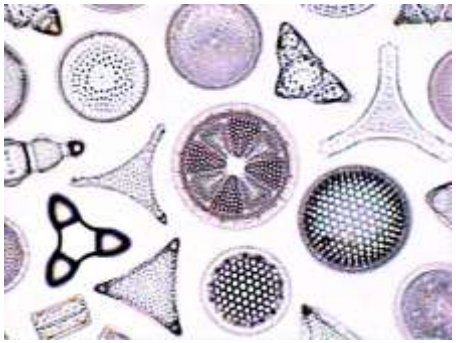
- All living things in an area
- **<u>Example</u>**:
- Pond: fish, frogs, plants…



Types of Organisms

water scavenger beetles





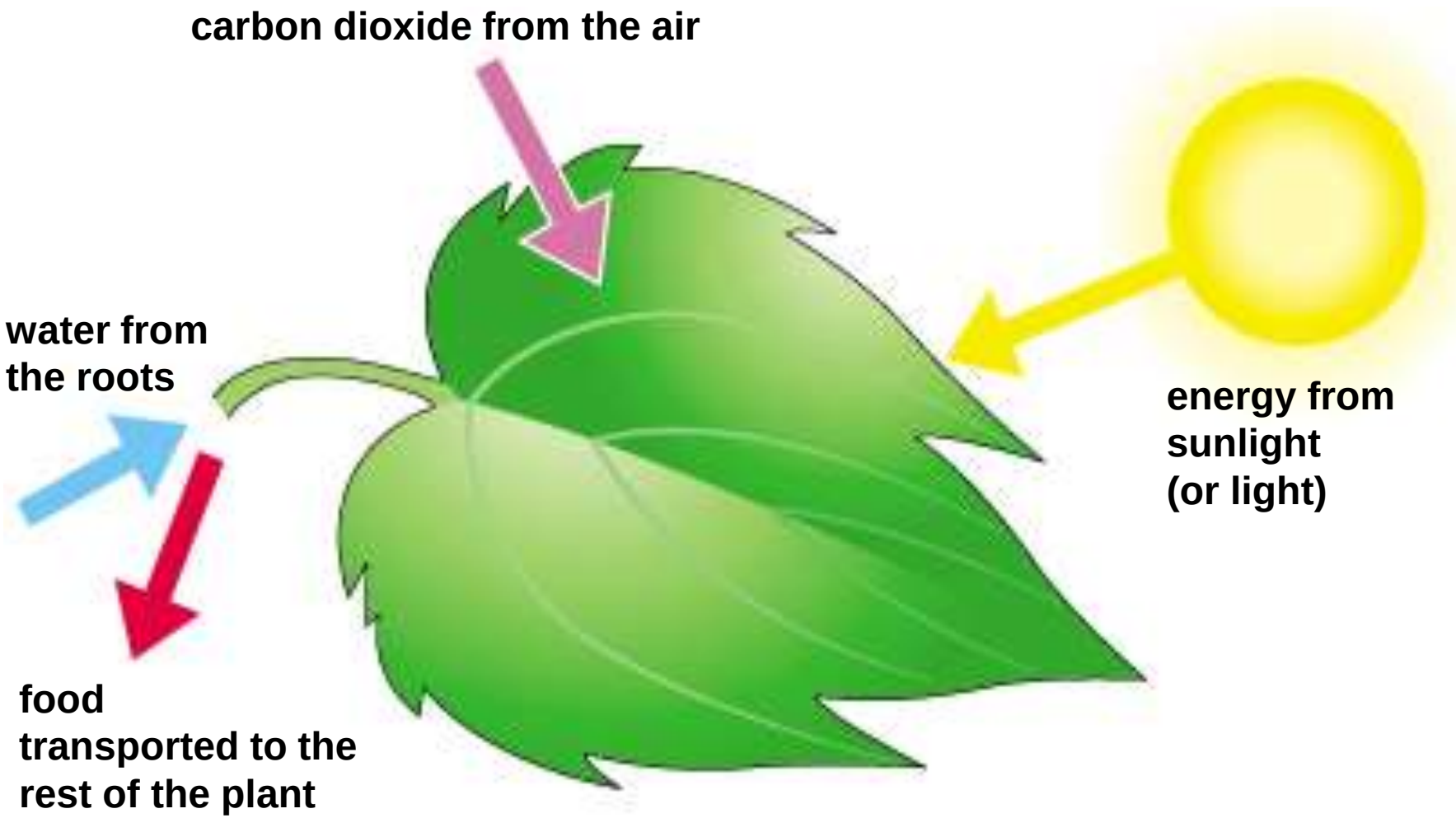
Producers

Producers are plants. They are able to make their own food through the process of photosynthesis. They make up the bulk of the food web.

Producers

- Autotrophs
- Plants

PLANTS ARE PRODUCERS.
YOU WILL FIND PLANTS
IN EVERY ECOSYSTEM.


carbon dioxide from the air
water from the roots
energy from sunlight (or light)
food transported to the rest of the plant

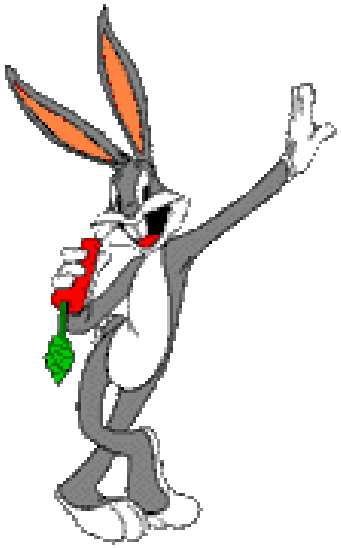
Consumers

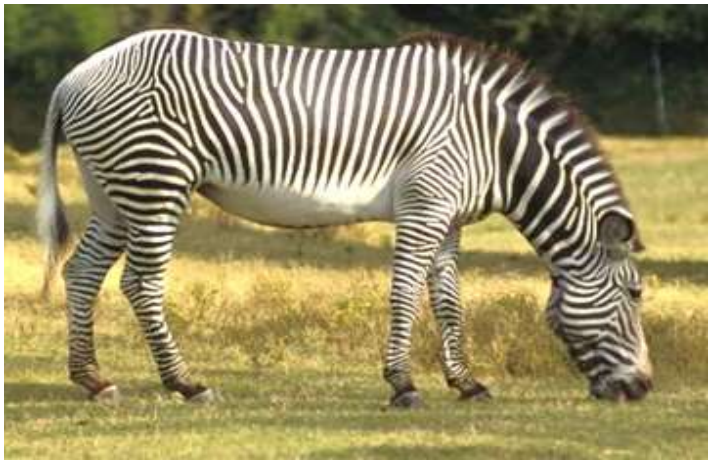
Consumers are pretty much every organism that eats something else. Primary consumers eat plants. Secondary consumers eat other consumers.

Consumers • Heterotrophs

- **Types**:
- 1. **Herbivores** =

- feed on producers
- primary consumers

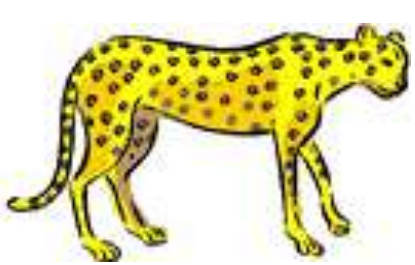





What's For Dinner?, Giant Panda

- 2. **<u>Carnivores</u>** =
- feed on animals (meat eating)
- Secondary consumer



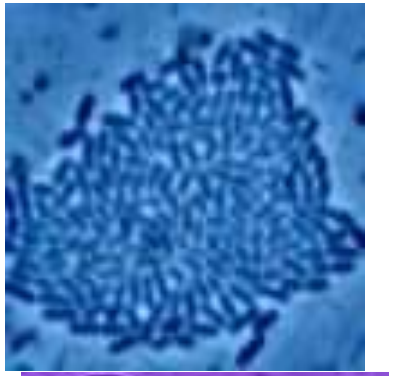





- 3. **Omnivores** =
- Eat plants & animals

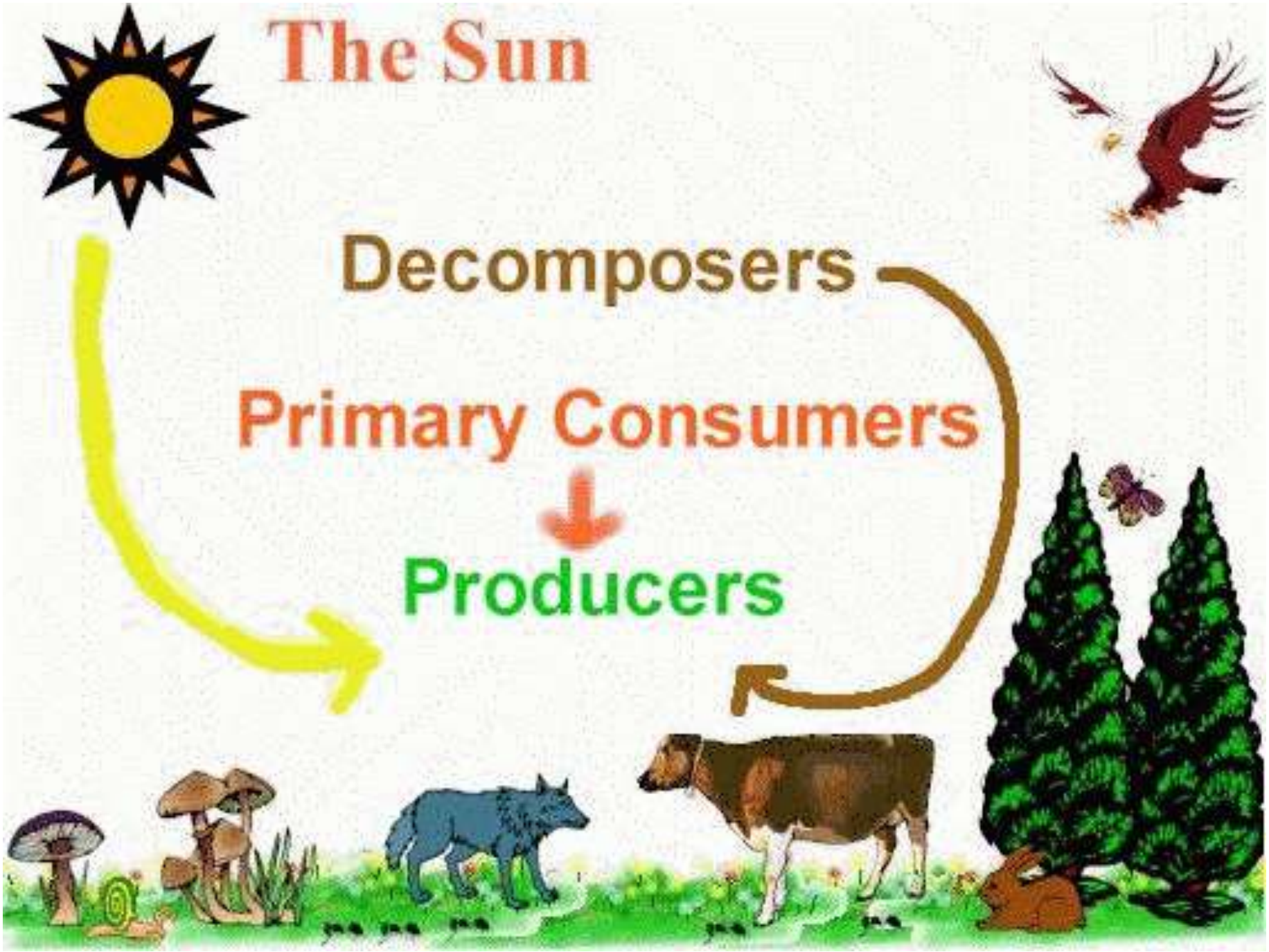
Decomposers

- Break down remains of dead organisms
- return nutrients into soil
- (bacteria and fungi)



DECOMPOSERS BREAK DOWN MATERIALS AND RETURN NUTRIENTS TO THE SOIL.

This apple is providing a feast for millions of bacteria.

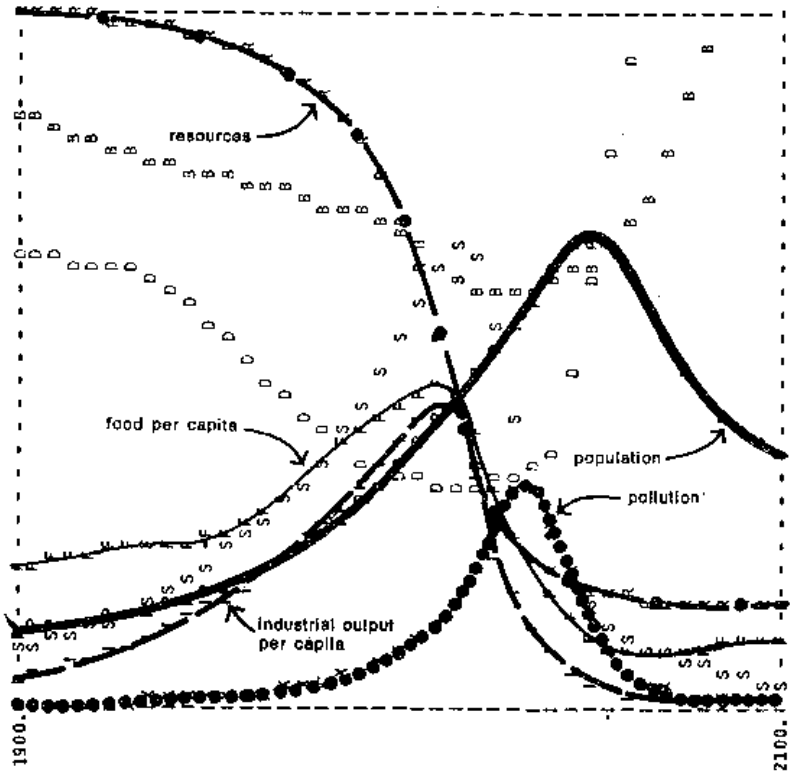

The Sun
Decomposers
Primary Consumers
Producers

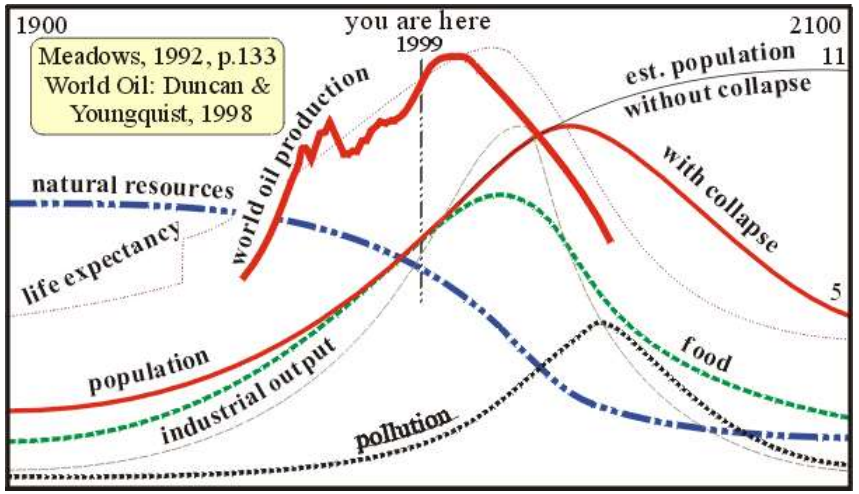
Sustainable Development

History – Assessing the principle

Limits to Growth

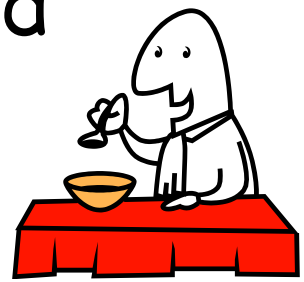
Figure 35 WORLD MODEL STANDARD RUN





Did you ever skip a meal and find that you were too tired to do much of anything?

Why do our bodies need food?

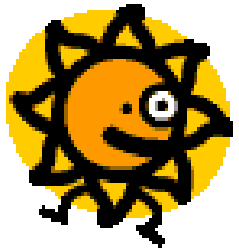


We need food to give us energy.

People are alive, and all living things and natural processes on Earth need **energy.**

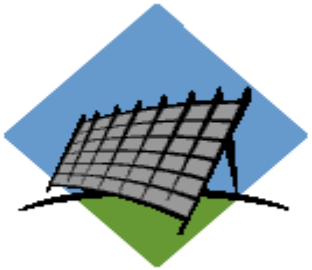
The *main source* of almost all heat and light energy on Earth is

the sun!

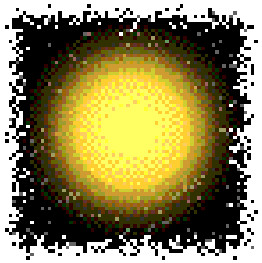


The sun  s an important source of energy.

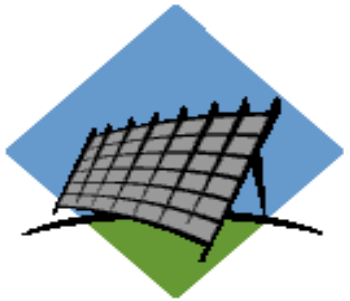
We can use the **sun's natural energy** in many ways.

Energy from the sun is called  solar energy.

Solar energy is best used in places that receive a lot of sunlight.



The energy is stored in **solar panels.**



If you place a cup of water on a windowsill on a bright, sunny day, what will happen to the water?

Hmm. . .think about it!

The **solar energy** from the sun will heat the water!

AIR POLLUTION (ENVIORMENTAL STUDIES)

Overview of the Topic

- Atmosphere as a Resource
- Types and Sources of Air Pollution
  - Major Classes of Air Pollutants
  - Sources of Outdoor Air Pollutants
  - Urban Air Pollution
- Effects of Air Pollution

Types and Sources of Air Pollution

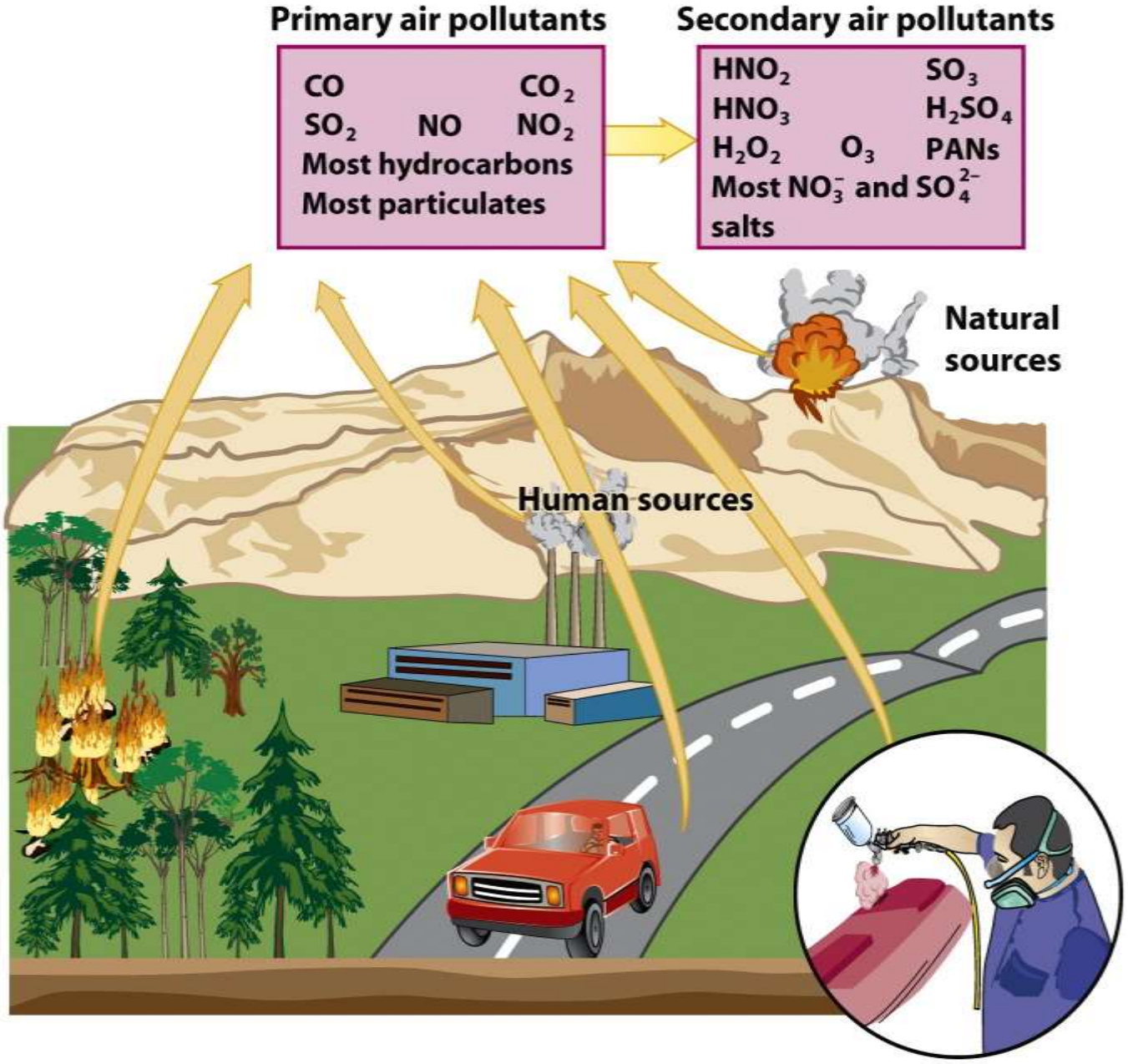
- Air Pollution
  - Chemicals added to the atmosphere by natural events or human activities in high enough concentrations to be harmful
- Two categories
  - Primary Air Pollutant
    - Harmful substance that is emitted directly into the atmosphere
  - Secondary Air Pollutant
    - Harmful substance formed in the atmosphere when a primary air pollutant reacts with substances normally found in the atmosphere or with other air pollutants

Major Air Pollutants

Table 20.1 Major Air Pollutants

Pollutant	Composition	Primary or Secondary	Characteristics
Particulate matter			
Dust	Variable	Primary	Solid particles
Lead	Pb	Primary	Solid particles
Sulfuric acid	H_2SO_4	Secondary	Liquid droplets
Nitrogen oxides			
Nitrogen dioxide	NO_2	Primary	Reddish-brown gas
Sulfur oxides			
Sulfur dioxide	SO_2	Primary	Colorless gas with strong odor
Carbon oxides			
Carbon monoxide	CO	Primary	Colorless, odorless gas
Carbon dioxide*	CO_2	Primary	Colorless, odorless gas
Hydrocarbons			
Methane	CH_4	Primary	Colorless, odorless gas
Benzene	C_6H_6	Primary	Liquid with sweet smell
Ozone	O_3	Secondary	Pale blue gas with acrid odor
Air toxics			
Chlorine	Cl_2	Primary	Yellow-green gas

* Discussed in Chapter 21.
Source: Environmental Protection Agency.


Primary air pollutants
CO
CO_2
SO_2
NO
NO_2
Most hydrocarbons
Most particulates
Secondary air pollutants
HNO_2
SO_3
HNO_3
H_2SO_4
H_2O_2
O_3
PANs
Most NO_3^- and SO_4^{2-} salts
Natural sources
Human sources

Major Classes of Air Pollutants

- Particulate Material
- Nitrogen Oxides
- Sulfur Oxides
- Carbon Oxides
- Hydrocarbons
- Ozone

Particulate Material

- Thousands of different solid or liquid particles suspended in air
  - Includes: soil particles, soot, lead, asbestos, sea salt, and sulfuric acid droplets
- Dangerous for 2 reasons
  - May contain materials with toxic or carcinogenic effects
  - Extremely small particles can become lodged in lungs

Nitrogen and Sulfur Oxides

- Nitrogen Oxides
  - Gases produced by the chemical interactions between atmospheric nitrogen and oxygen at high temperature
  - Problems
    - Greenhouse gases
    - Cause difficulty breathing
- Sulfur Oxides
  - Gases produced by the chemical interactions between sulfur and oxygen
  - Causes acid precipitation

Carbon Oxides and Hydrocarbons

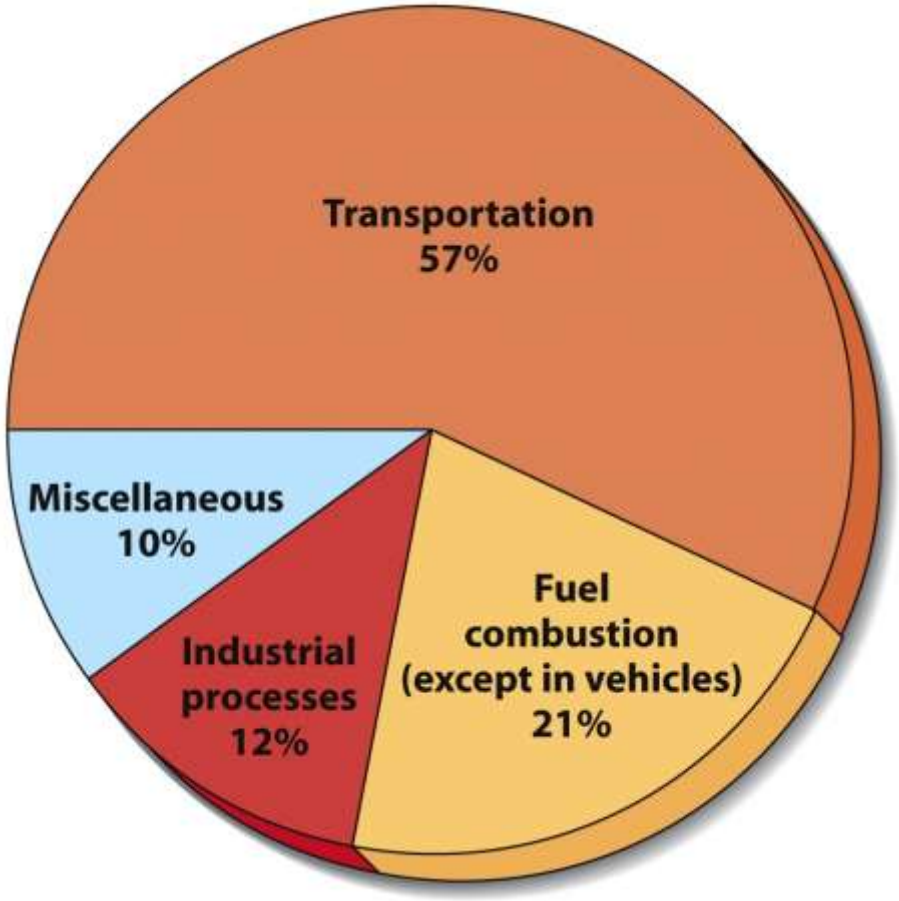
- Carbon Oxides
  - Gases carbon monoxide (CO) and carbon dioxide (CO_2)
  - Greenhouse gases
- Hydrocarbons
  - Diverse group of organic compounds that contain only hydrogen and carbon (ex: CH_4- methane)
  - Some are related to photochemical smog and greenhouse gases

Ozone

- Tropospheric Ozone
  - Man- made pollutant in the lower atmosphere
  - Secondary air pollutant
  - Component of photochemical smog
- Stratospheric Ozone
  - Essential component that screens out UV radiation in the upper atmosphere
  - Man- made pollutants (ex: CFCs) can destroy it

Sources of Outdoor Air Pollution

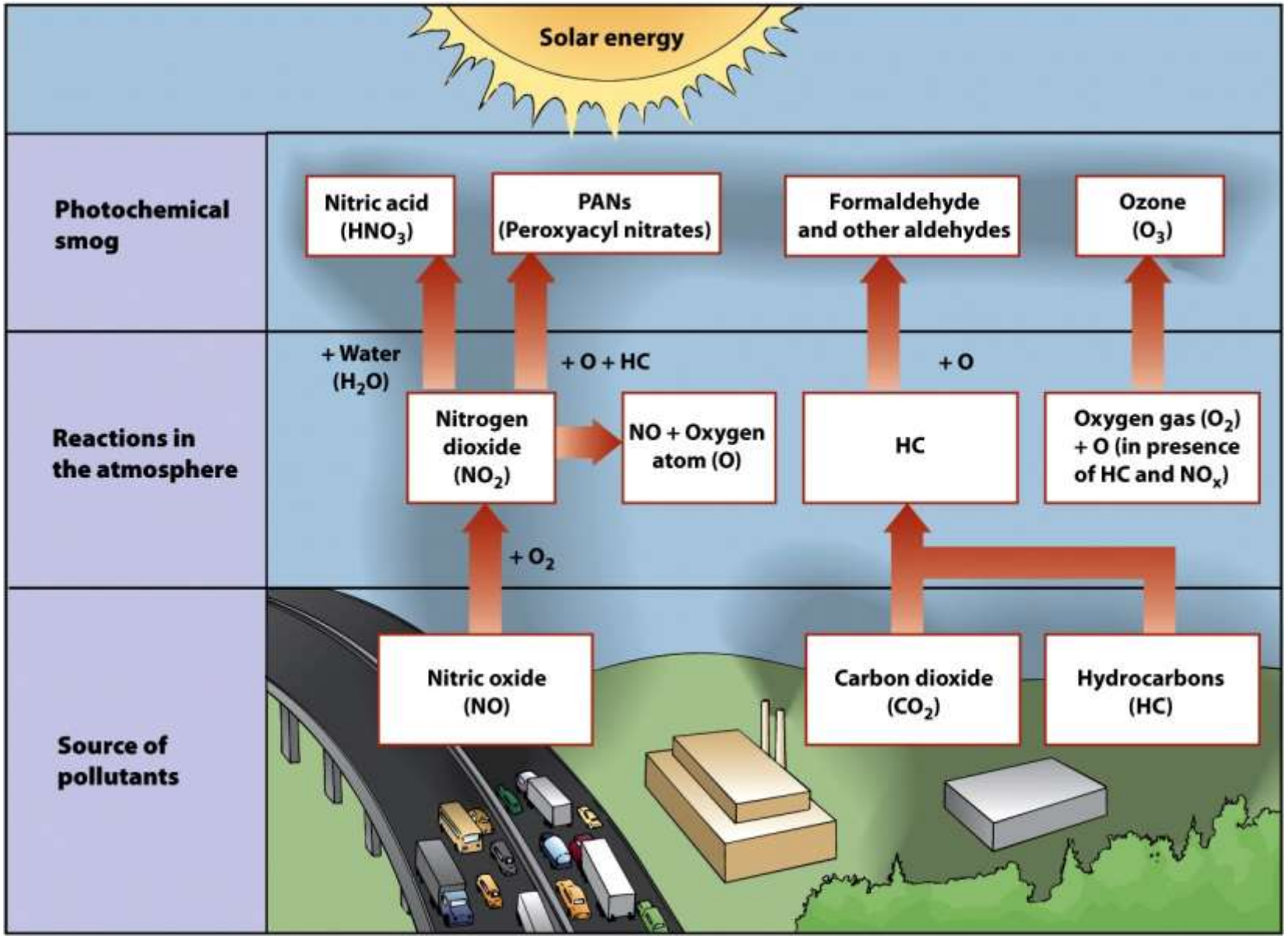
- Two main sources
  - Transportation
  - Industry
- Intentional forest fires is also high



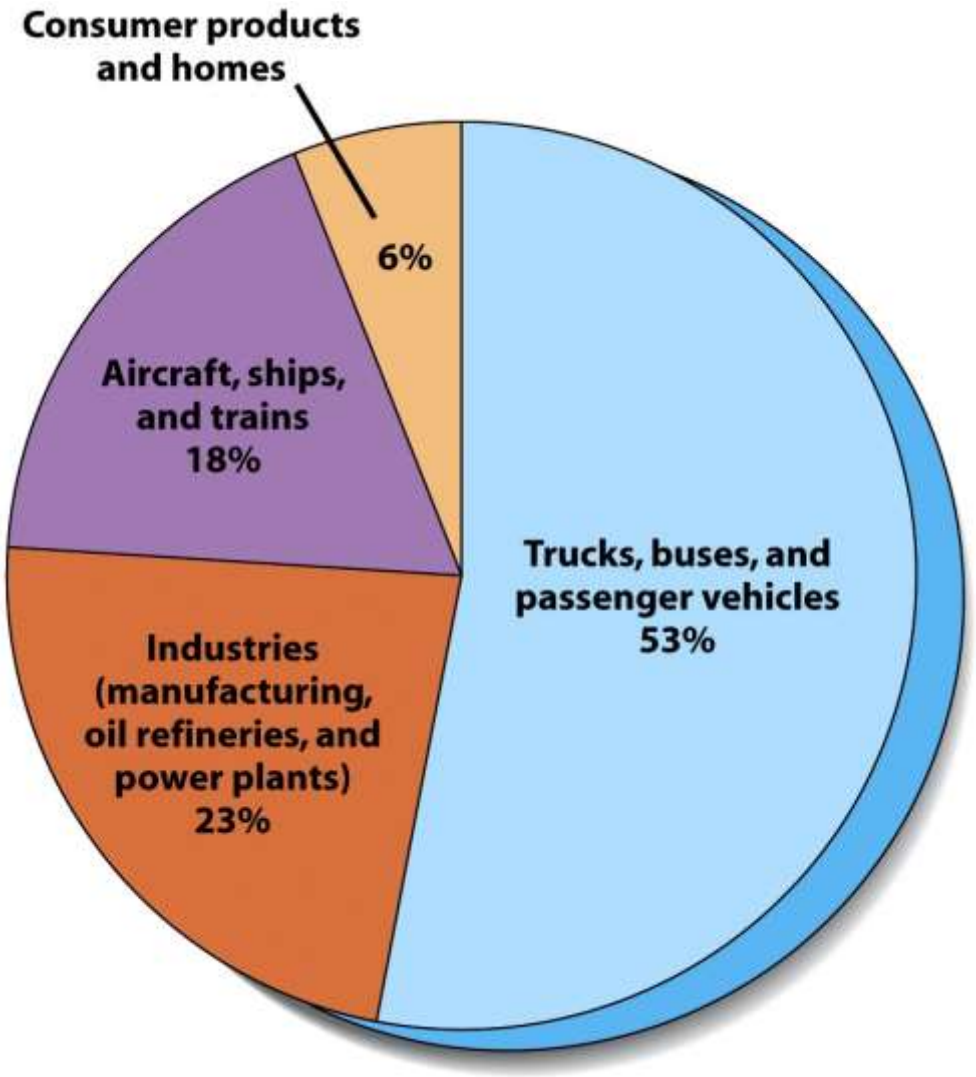
Urban Air Pollution

- Photochemical Smog (ex: Los Angeles below)
  - Brownish-orange haze formed by chemical reactions involving sunlight, nitrogen oxide, and hydrocarbons

Formation of Photochemical Smog



Sources of Smog in Los Angeles



Effects of Air Pollution

- Low level exposure
  - Irritates eyes
  - Causes inflammation of respiratory tract
- Can develop into chronic respiratory diseases

Table 20.2 Health Effects of Several Major Air Pollutants

Pollutant	*Source*	*Effects*
Particulate	Industries, electric power plants, motor vehicles, construction, agriculture	Aggravates respiratory illnesses; long-term exposure may cause increased incidence of chronic conditions such as bronchitis; linked to heart disease; suppresses immune system; some particles, such as heavy metals and organic chemicals, may cause cancer or other tissue damage
Nitrogen oxides	Motor vehicles, industries, heavily fertilized farmland	Irritate respiratory tract; aggravate respiratory conditions such as asthma and chronic bronchitis
Sulfur oxides	Electric power plants and other industries	Irritate respiratory tract; same effects as particulates
Carbon monoxide	Motor vehicles, industries, fireplaces	Reduces blood's ability to transport oxygen; headache and fatigue at lower levels; mental impairment or death at high levels
Ozone	Formed in atmosphere (secondary air pollutant)	Irritates eyes; irritates respiratory tract; produces chest discomfort; aggravates respiratory conditions such as asthma and chronic bronchitis

Health Effects of Air Pollution

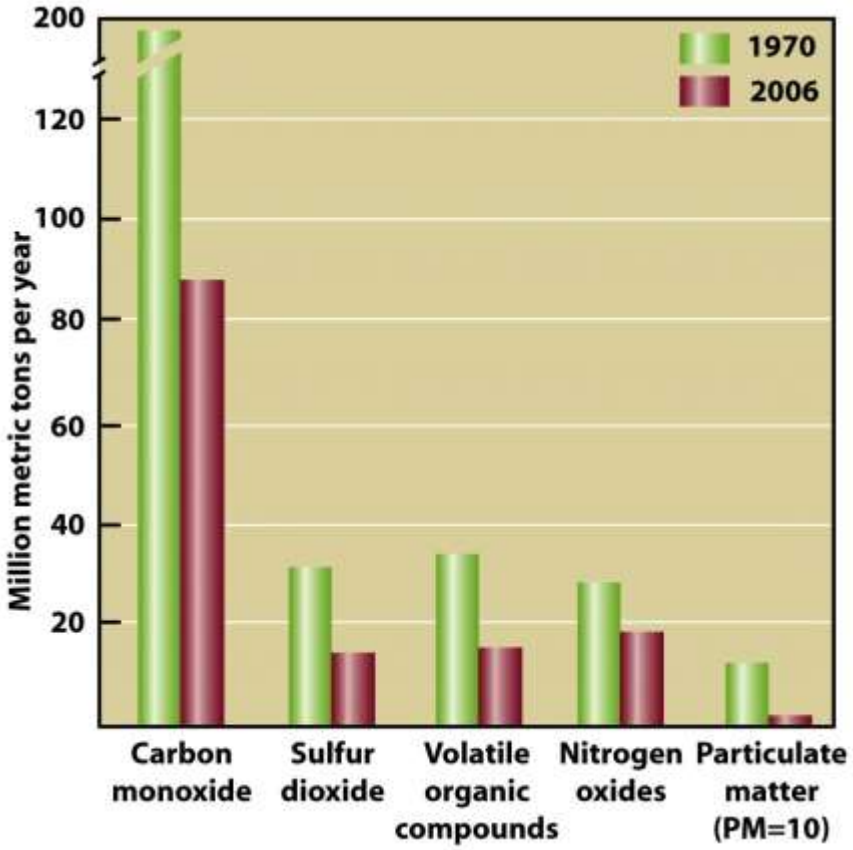
- Sulfur Dioxide and Particulate material
  - Irritate respiratory tract and impair ability of lungs to exchange gases
- Nitrogen Dioxides
  - Causes airway restriction
- Carbon monoxide
  - Binds with iron in blood hemoglobin
  - Causes headache, fatigue, drowsiness, death
- Ozone
  - Causes burning eyes, coughing, and chest discomfort

Children and Air Pollution

- Greater health threat to children than adults
  - Air pollution can restrict lung development
  - Children breath more often than adults
- Children who live in high ozone areas are more likely to develop asthma

The Clean Air Act

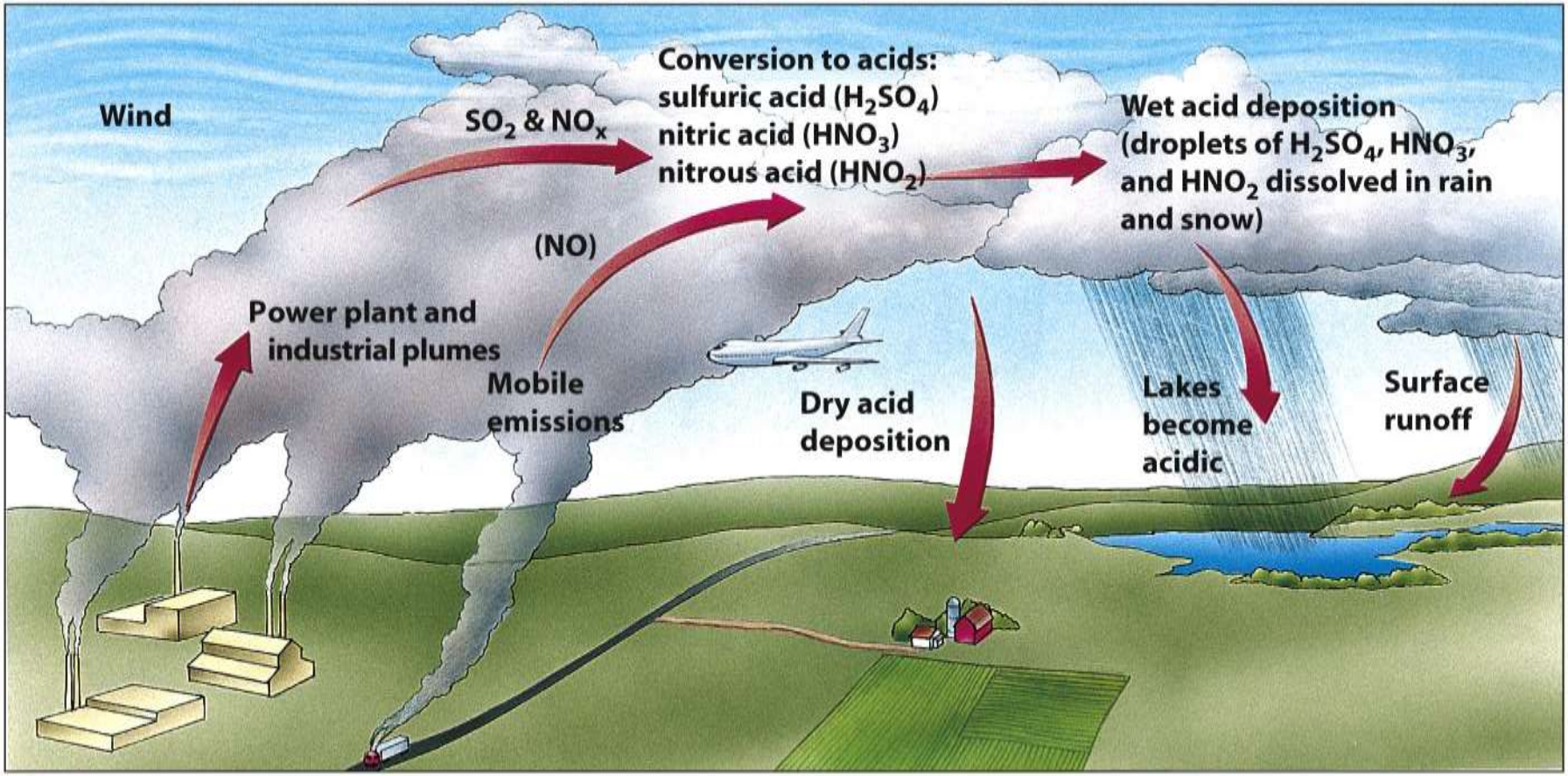
- Authorizes EPA to set limits on amount of specific air pollutants permitted
- Focuses on 6 pollutants:
  - lead, particulate matter, sulfur dioxide, carbon monoxide, nitrogen oxides, and ozone
- Act has led to decreases!



Other Ways to Improve Air Quality

- Reduce sulfur content in gasoline from its current average of 330 ppm to 30 ppm
  - Sulfur clogs catalytic converters
- Require federal emission standards for all passenger vehicles
  - Including SUVs, trucks and minivans
- Require emission testing for all vehicles
  - Including diesel

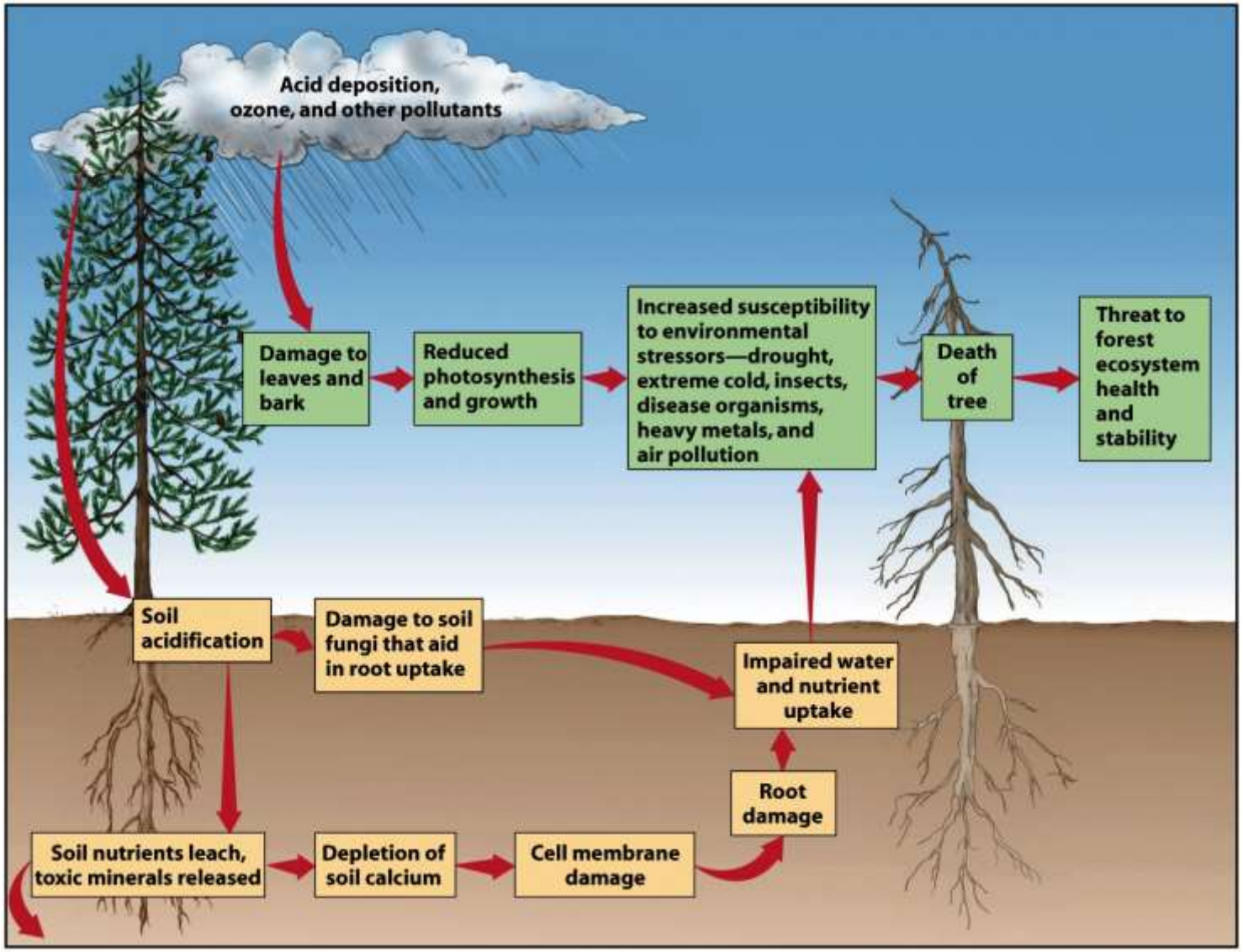
How Acid Deposition Develops



Effects of Acid Deposition

- Declining Aquatic Animal Populations
- Thin-shelled eggs prevent bird reproduction
  - Because calcium is unavailable in acidic soil
- Forest decline
  - Ex: Black forest in Germany (50% is destroyed)

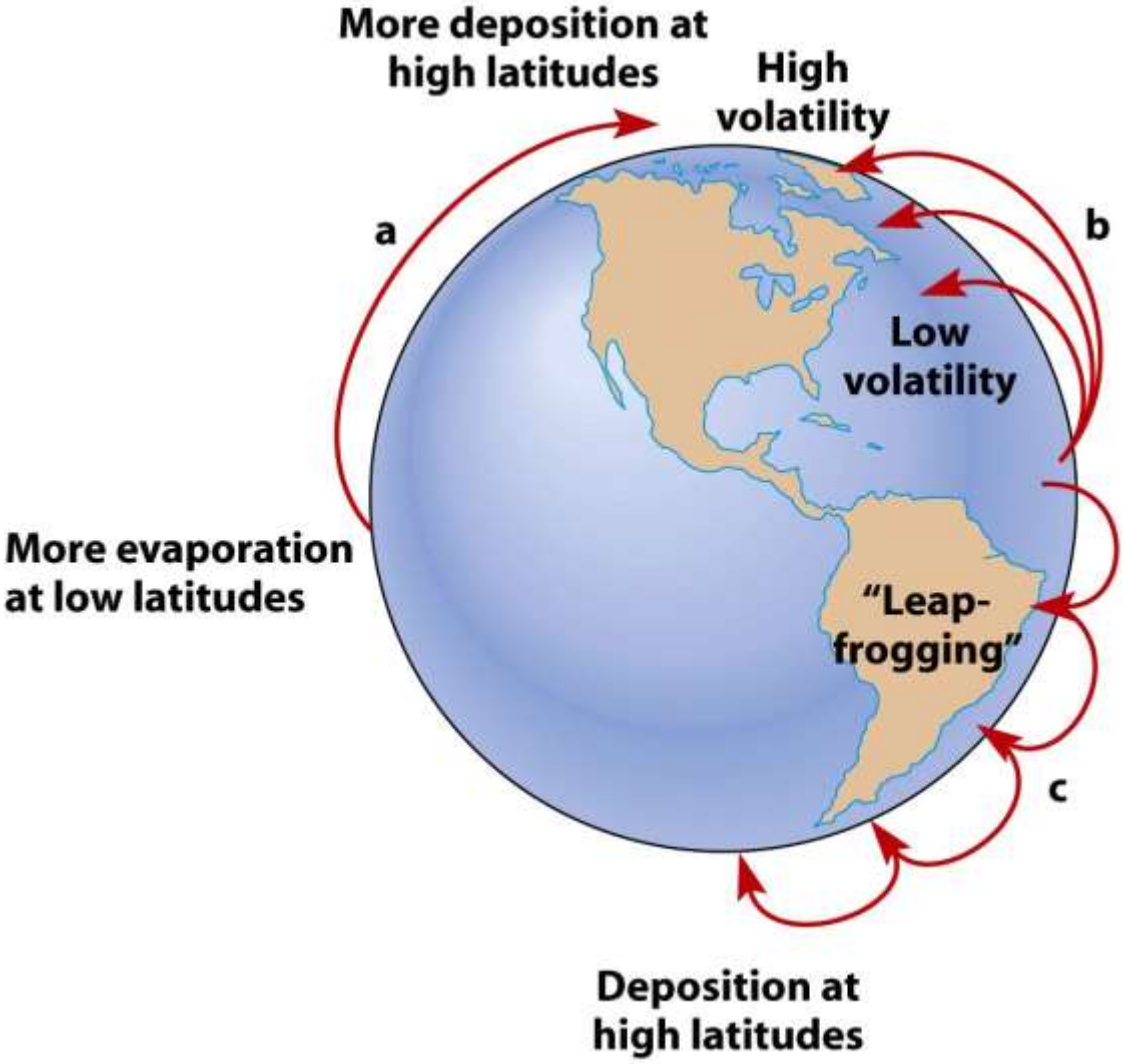
Acid Deposition and Forest Decline



Air Pollution Around the World

- Air quality is deteriorating rapidly in developing countries
- Shenyang, China
  - Residents only see sunlight a few weeks each year
- Developing countries have older cars
  - Still use leaded gasoline
- 5 worst cities in world
  - Beijing, China; Mexico City, Mexico; Shanghai, China; Tehran, Iran; and Calcutta, India

Long Distance Transport of Air Pollutants



Solar energy from the sun is a **natural resource**.

That means that the energy source can be found in nature.

Solar energy is not the only natural energy resource.

Wind and **water** are also found in nature. They can be used to create energy. **Wind** and **water** are natural resources.

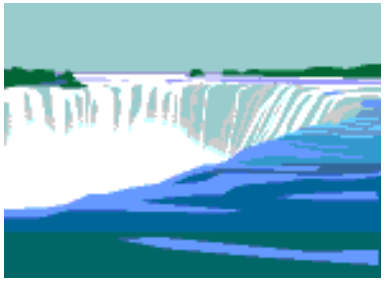
Wind energy is used to create electricity.

Wind energy can only be used in windy places, like on mountains.

Wind is a **natural resource**. It is found in nature.

Water is also used to create electricity.

Water power that is used to create electricity is called **hydroelectric** power.



Dams use moving water to make electricity in places where there are large bodies of water.

Oops! Wrong kind of body!

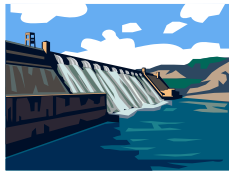
Hydroelectric power can run mills that produce energy.

So far we've learned about 3 kinds of natural resources:

The sun → solar panels

Wind → windmills

Moving water → dams



Let's learn about another natural resource:

Trees!

We get wood from trees.

We can burn wood to get fuel for energy.

Wood is a natural resource.

Wow! This is fun!

That means it is found in nature.

So far we've learned about 4 natural sources of energy:

the sun

wind

water

trees

Let's learn about another energy resource that is found in nature.

Let's learn about fossil fuels, which are also natural resources.

Fossil fuels are formed from the remains of plants and animals that lived and died long ago.

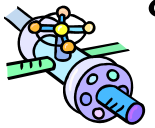
Over time, the remains of dead plants and animals are changed into energy-rich fuels, called fossil fuels.

Some examples of fossil fuels:

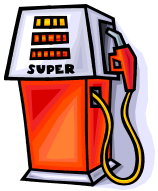
- coal

- petroleum (oil)

- natural gas



- gasoline



Where can we find fossil fuels?

We can find these natural resources under the ground!

Now that we have learned about different kinds of natural resources, let's look at resources a different way.

Let's divide types of resources by how long it takes us to get more...

We can divide resources into 2 categories:

Renewable	Nonrenewable

Renewable Resources

Nonrenewable Resources

can be replenished in a human lifetime

take longer than a human lifetime to replace

Renewable Resources

Nonrenewable Resources

Sun

Wind

Water

Fossil fuels

As you can tell, it takes longer to get more of the nonrenewable resources.

That's why we need to conserve our nonrenewable resources. We need to use them wisely and not waste them.

We renew our water through the water cycle!

We can group energy sources according to how long it takes to renew them.

Renewable sources	Nonrenewable sources

Renewable sources can be renewed in a human lifetime.

Nonrenewable sources take longer than a human lifetime to renew.

sun

wind

water

fossil fuels

So now you are an expert about your environment!

End of slideshow!