

Water Pollution

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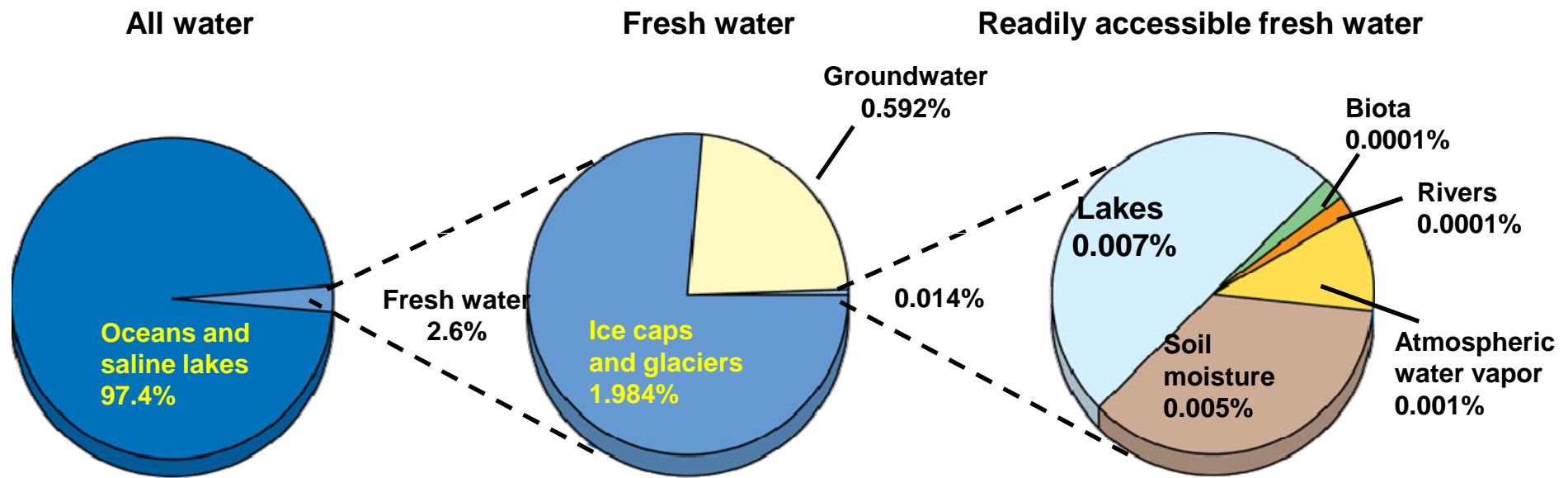
Water covers over 70% of the Earth's surface

Water is a very important resource for people and the environment.

The total amount of water on the earth is about 1.35 billion KM^3 distributing as showing in table 1

Table 1: Location of the world waters	
Volume as Percentage	Location
97.200%	salt water in the oceans
02.014%	ice caps and glaciers
00.600%	groundwater
00.009%	surface water
00.005%	soil moisture
00.001%	atmospheric moisture

Location of the world waters



Water pollution affects drinking water, groundwater, rivers, lakes and oceans all over the world.

This consequently harms human health and the natural environment.

•What is water pollution?

In 1971 United Nations report defined ocean pollution as:

"The introduction by man, directly or indirectly, of substances or energy into the marine environment resulting in such deleterious effects as harm to living resources, hazards to human health, hinderance to marine activities, including fishing, impairment of quality for use of sea water and reduction of amenities."

What is water pollution?

Any chemical, biological, or physical change in water quality that has a harmful effect on living organisms or makes water unsuitable for desired usage.

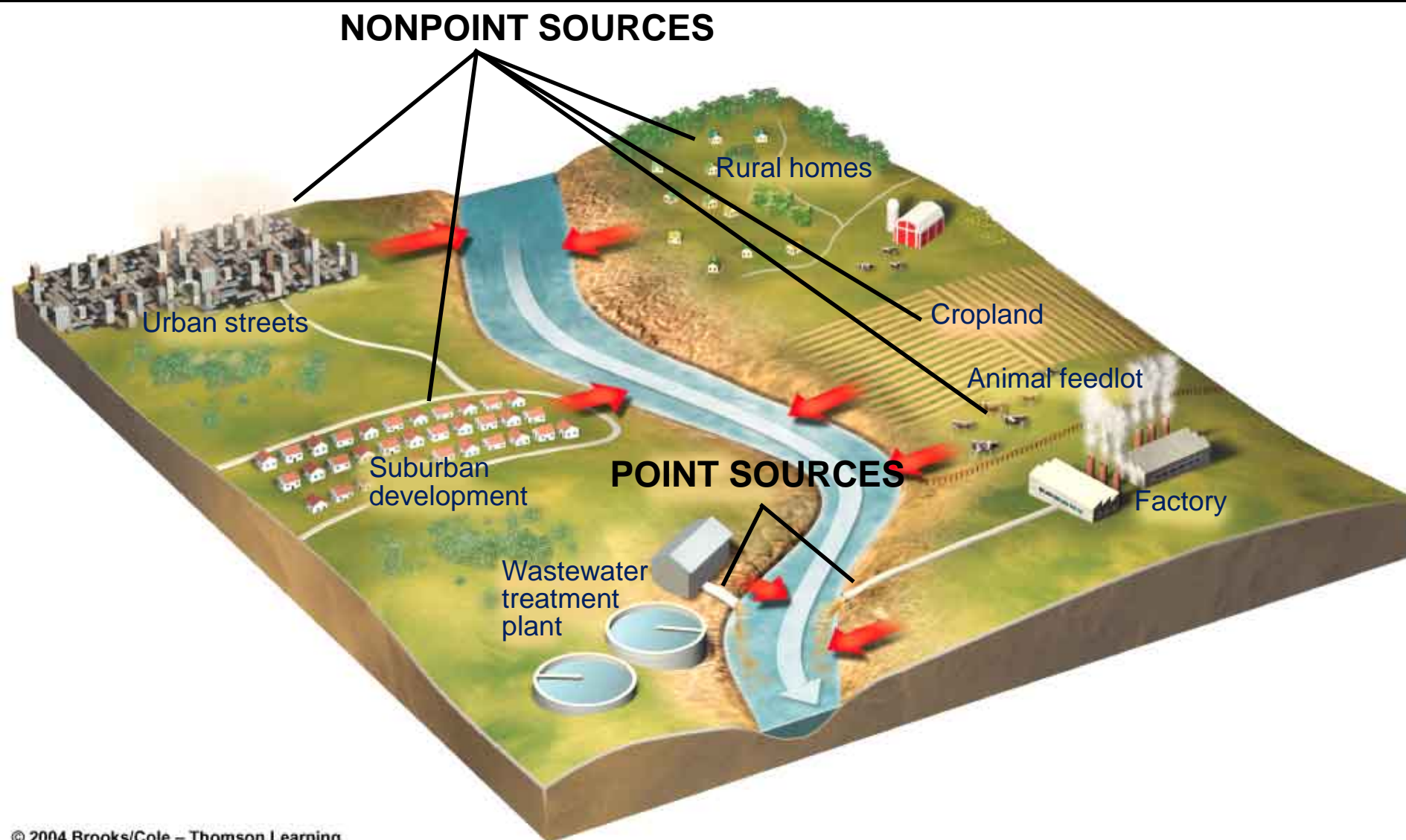


What are the types of water pollutant?

Point Source Pollution
VS.
Nonpoint Source Pollution

What's the difference?

Point and Nonpoint Sources



Point Source Pollution

- p Comes from a specific source, like a pipe
- p Factories, industry, municipal treatment plants
- p Can be monitored and controlled by a permit system



What is nonpoint source pollution?

- ⌘ Nonpoint Source (NPS) Pollution is pollution associated with stormwater or runoff
- ⌘ NPS pollution cannot be traced to a direct discharge point such as a wastewater treatment facility



Examples of NPS

- p oil & grease from cars
- p fertilizers
- p animal waste
- p septic systems
- p sewage & cleaners from boats
- p household cleaning products
- p litter

When the pollution affects the environment many miles away from the source, like nuclear waste, it is called **transboundary pollution**.

Major Sources of Water Pollution

1-Domestic sewage.

2-Agriculture: by far the leader : Sediment, **Nutrients** or fertilizers, **Pathogens** from livestock, food processing, salt from soil irrigation, **Pesticides**

3-Industrial: factories and powerplants

4-Mining: surface mining toxics, acids, sediment

What are the main types of water pollutants

Sediment

Soil particles
transported from their
source

Biochemical Oxygen Demand (BOD)

? Oxygen depleting material or substances
Ø Leaves
Ø Organic material

Toxics

? **Pesticides**

- Ø Herbicides
- Ø Fungicides
- Ø Insecticides

? **Metals (naturally occurring in soil, automotive emissions/ tires)**

- Ø Lead
- Ø Zinc
- Ø Mercury

? **Petroleum Hydrocarbons**
(automotive exhaust and fuel/oil)

Nutrients

? Various types of materials that become dissolved and suspended in water (commonly found in fertilizer and plant material):

- Ø Nitrogen (N)
- Ø Phosphorus (P)

Bacteria/ Pathogens

Originating from:

- ? Pets
- ? Waterfowl
- ? Failing septic systems

Thermal Stress

Heated runoff,
removal of
streamside
vegetation

What are the main types of water pollutants

Pollutants Found in Runoff

Sediment: soils and silts from land erosion can disrupt photosynthesis, destroy spawning grounds, clog rivers and streams

Oxygen Demanding Wastes: organic waste that needs oxygen often from animal waste, paper mills and food processing.

Organic Chemicals: oil, gasoline, plastics, detergents often from surface runoff, industries and cleaners

Pollutants Found in Runoff

Inorganic Chemicals: Acids and toxic chemicals often from runoff, industries and household cleaners

Plant Nutrients: water soluble nitrates, ammonia and phosphates often from sewage, agriculture and urban fertilizers

Heat Pollution and Radioactivity: mostly from powerplants

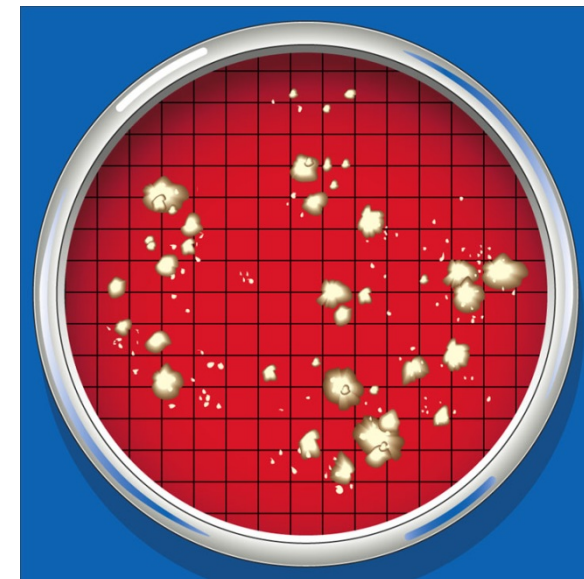
Infectious Agents: bacteria and viruses often from animal wastes

How do we measure water quality

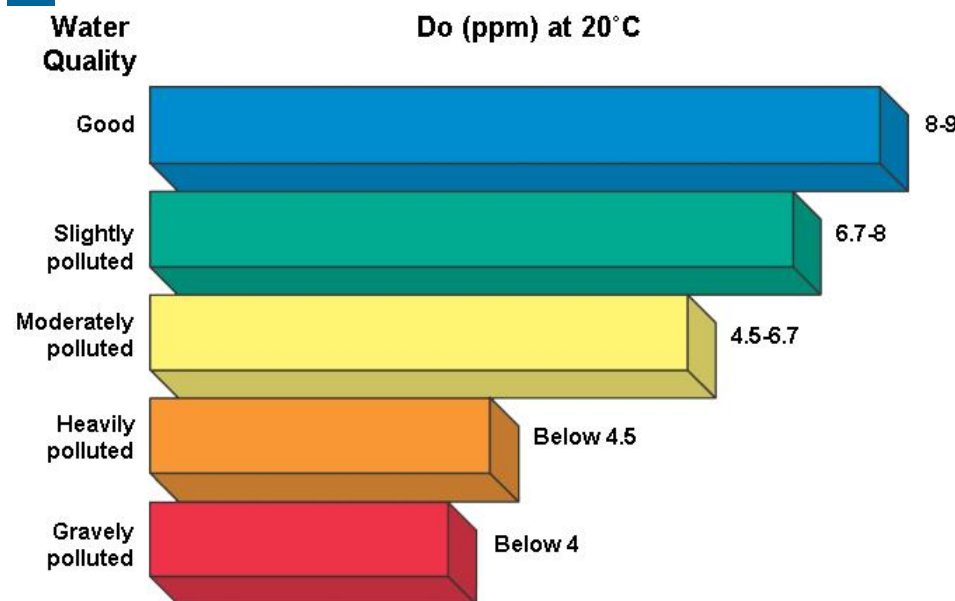
Bacterial Counts: Fecal coliform counts from intestines of animals

- ⌞ None per 100 ml for drinking
- ⌞ >200 per 100 ml for swimming

Sources: human sewage, animals, birds, raccoons, etc.



How do we measure water quality



Dissolved Oxygen:

**Biological Oxygen Demand
(BOD)...**

the amount of oxygen
consumed by aquatic
decomposers.

**Low BOD means little pollution and high
BOD means higher organic pollution**

Chemical Analysis: looking for presence of inorganic or
organic chemicals

Suspended Sediment : water clarity

How do we measure water quality

Indicator Species: organisms that give an idea of the health of the water body.

p Mussels, oysters and clams filter water



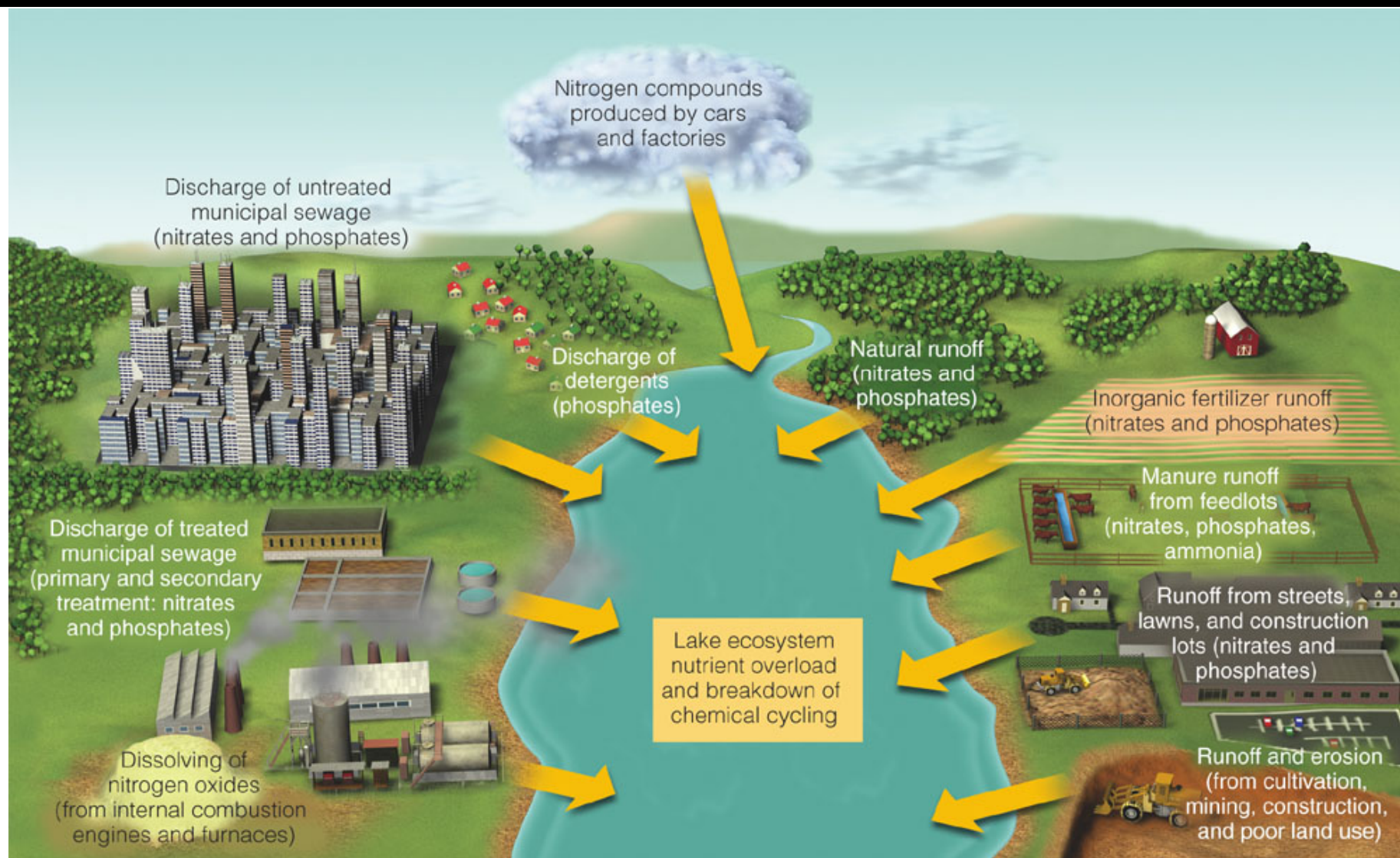
Water pollutant impacts

Some phenomenon related to Water Pollution:

1- Eutrophication

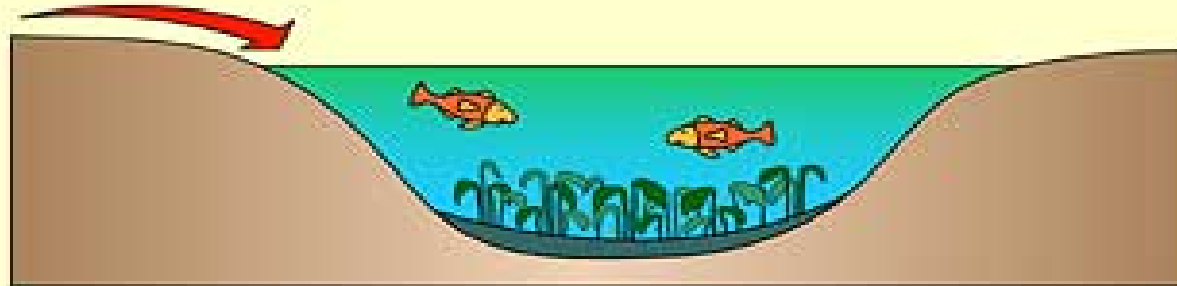
- Ø Water system is polluted by dumping of sewage which includes organic matter and by the runoff from the agricultural fields that contains fertilizers(phosphorus and Nitrogen).
- Ø It contains Excess amounts of phosphorus and Nitrogen which leads to algae blooms and aquatic plants.
- Ø Increases of algae growth encourage the number of the decomposers in the ecosystem. All these life use the oxygen in the water for respiration.
- Ø It causes great demand for oxygen and results in depletion of oxygen.

Eutrophication

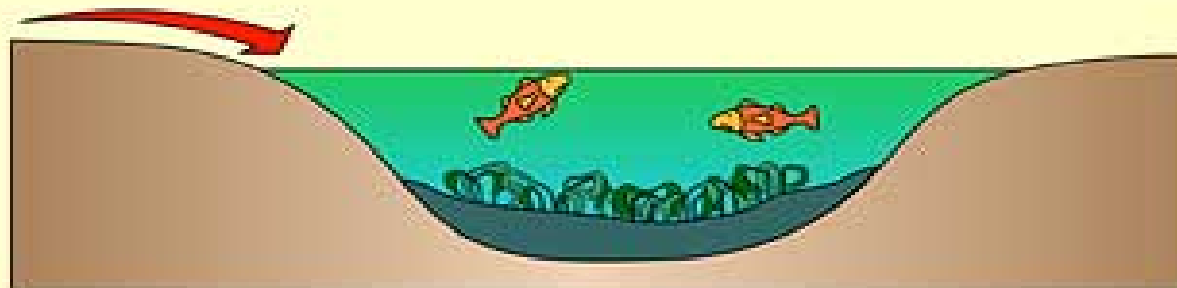


Eutrophication of Lakes

Fertiliser run-off

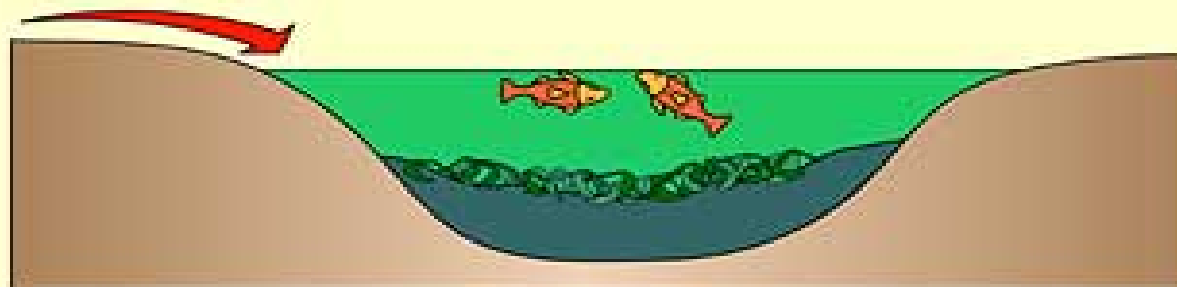


1. Algae grow fast, using up lots of oxygen and blocking sunlight



2. Aquatic plants begin to die

3. Dead matter provides food for microbes ...



4. ... increasing the competition for oxygen

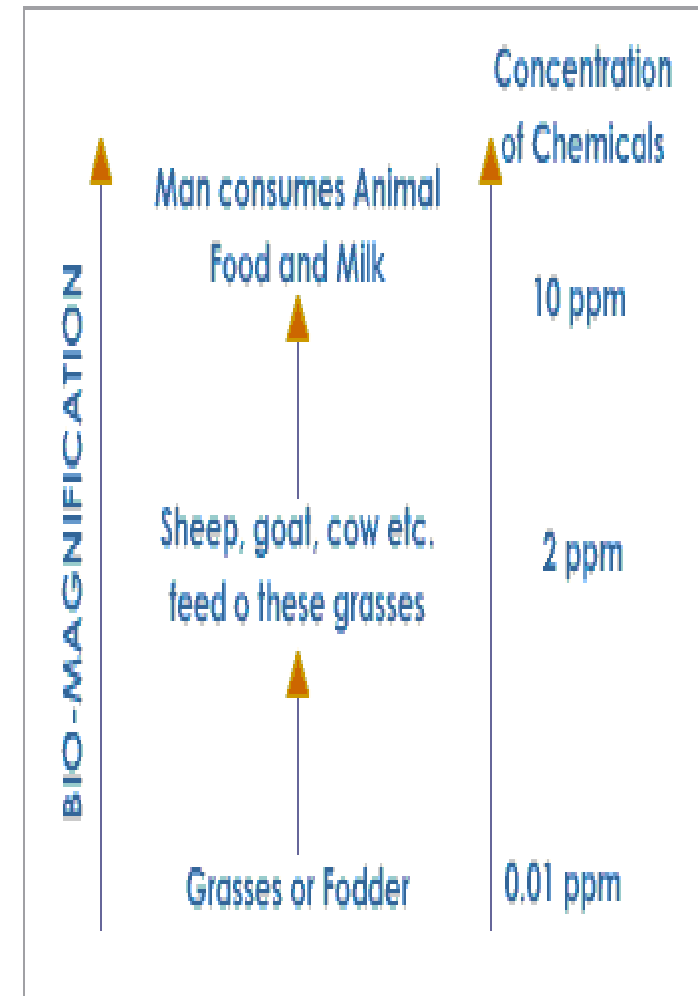
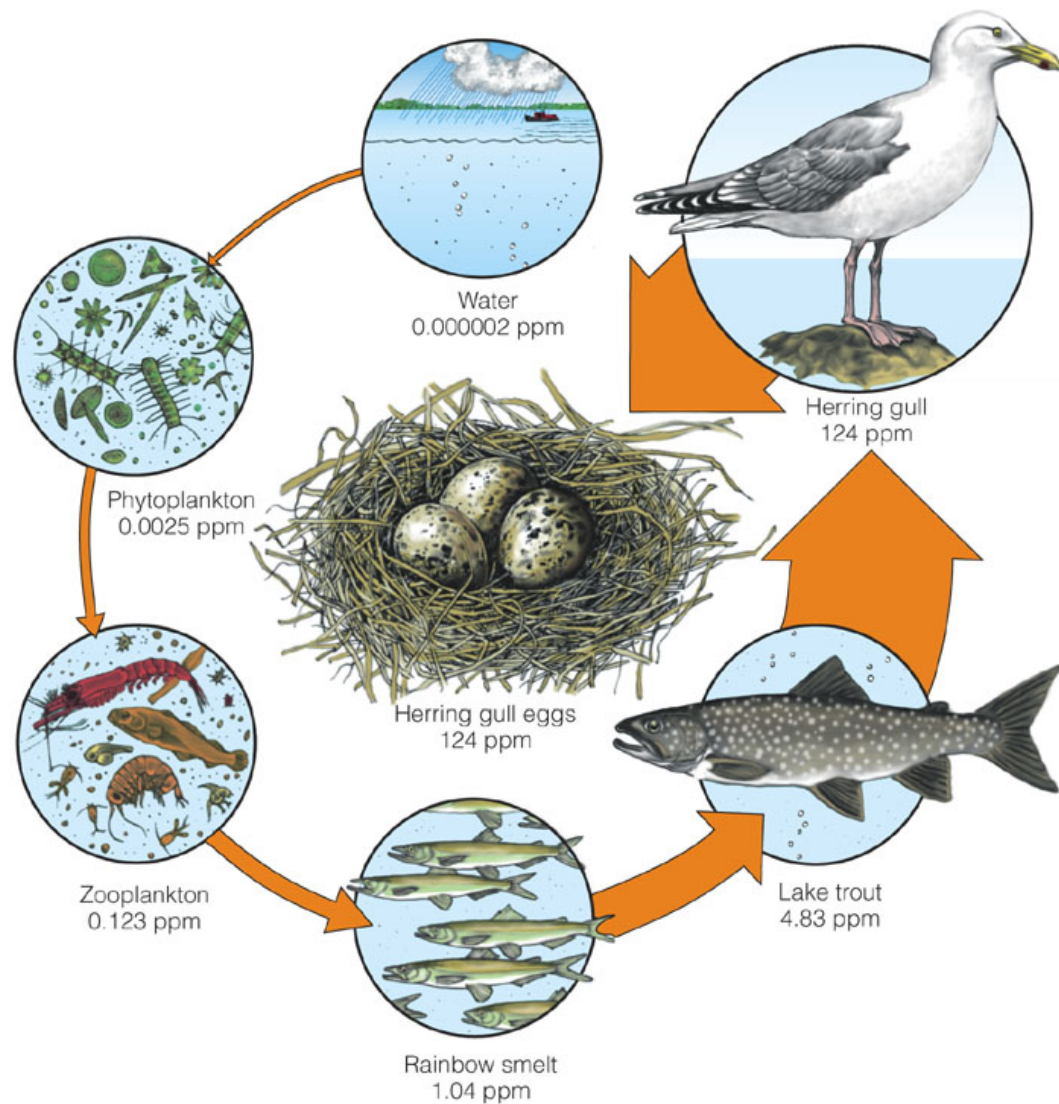
5. Water becomes deoxygenated - fish die

Biomagnifications

pollutants as DDT (pesticides) or heavy metals are not **bio-degradable**. contamination of water with these pollutants results in their entry into the microscopic plants and animals. These organisms are fed upon by higher aquatic life like the fish. The fish in turn are fed upon by the land animals including human.

Thus, the pollutant reaches the human body. At each step in the food chain, the contaminant increases in quantity.

2- Biomagnifications



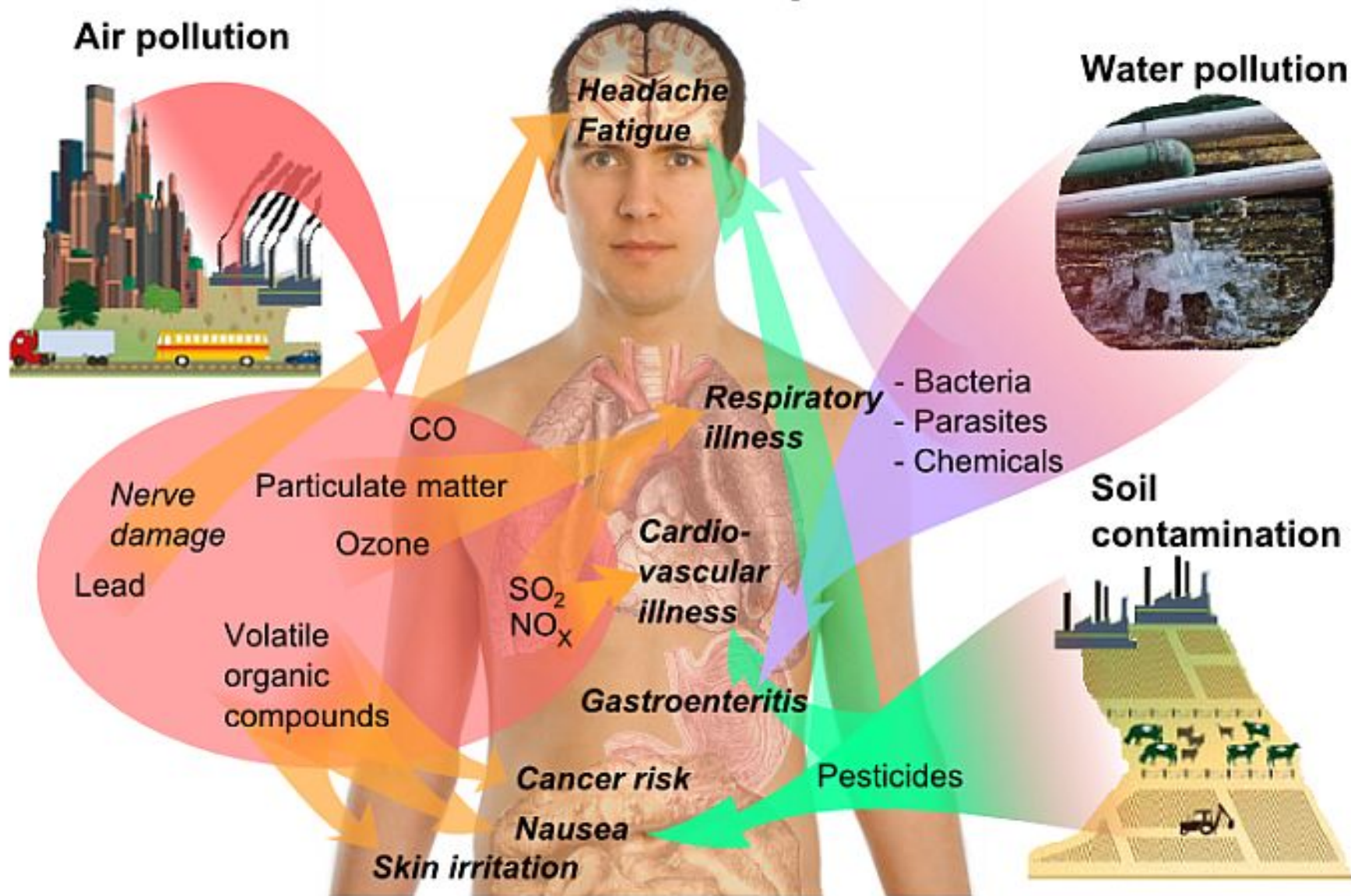
Epidemics

Pollution of water by organic wastes is a major cause for occurrence of epidemics like cholera, gastroenteritis in India. The microorganisms causing these diseases enter the water bodies through the organic wastes and then into the bodies of healthy persons causing diseases. In fact, a good indication of pollution of water is the presence of bacteria *E. coli* that lives in the human intestines.

Some example of Effects of Water

Pollutant	Source/Cause	Effect
Sewage includes domestic wastes, hospital wastes,	Sewage of rural and urban areas.	Oxygen depletion Spread of diseases/ epidemics
Metals-Mercury	Industrial wastes	Minamata disease (resulted from the contaminated waters of the Minamata bay in Japan in 1953) - causes numbness of limbs, lips and tongue, blurred vision, deafness and mental derangement.
Lead	Industrial wastes	Absorbed into blood and affects, liver, kidney, bone, brain and the penpheral nervous system. Lead poisoning can even lead to coma.
Cadmium	Cadmium Industrial, fertilizers	Deposited in organs like the kidney, pancreas, liver, etc. Cadmium poisoning causes headache, vomiting, bronchial pneumonia, kidney necrosis,
Arsenic	Fertilizers	Arsenic poisoning causes renal failure and death, It can cause nerve disorder, kidney and liver disorders, muscular atrophy, etc.
Agrochemicals like DDT	Pesticides	Accumulates in the bodies of fishes, birds, mammals including man. Adversely affectsthe nervous svstem fertilitv etc.

Health effects of pollution



Potential Sources of Pollutants Found in Residential Areas



- p Nutrients: Fertilizers and septic systems
- p Pathogens: Pet waste and septic systems
- p Sediment: Construction, road sand, soil erosion
- p Toxic: Pesticides, household products
- p Debris: Litter and illegal dumping
- p Thermal: heated runoff, removal of streamside vegetation