Title : Water Pollution

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Lecture No : 03 (11:30 to 12:30)

Source of information : Environmental Science /B. R. Shah & Dr. Snehal Popli

Water Pollution

Water pollution is the contamination of water bodies, usually as a result of human activities.

Characteristics of water

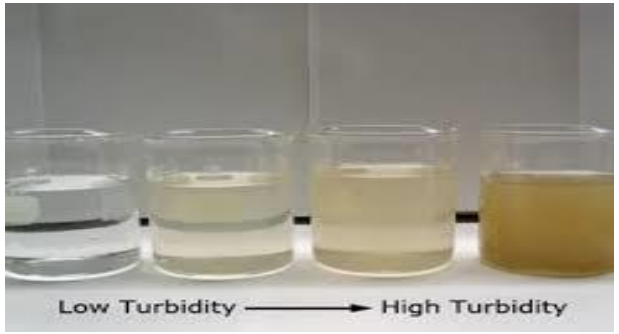
It is divided into two characteristics.

A) physical – colour, temperature, odour, ,turbidity, electrical conductivity.

B) chemical – nutrients, alkanity, Ph, dissolved oxygen, BOD,COD

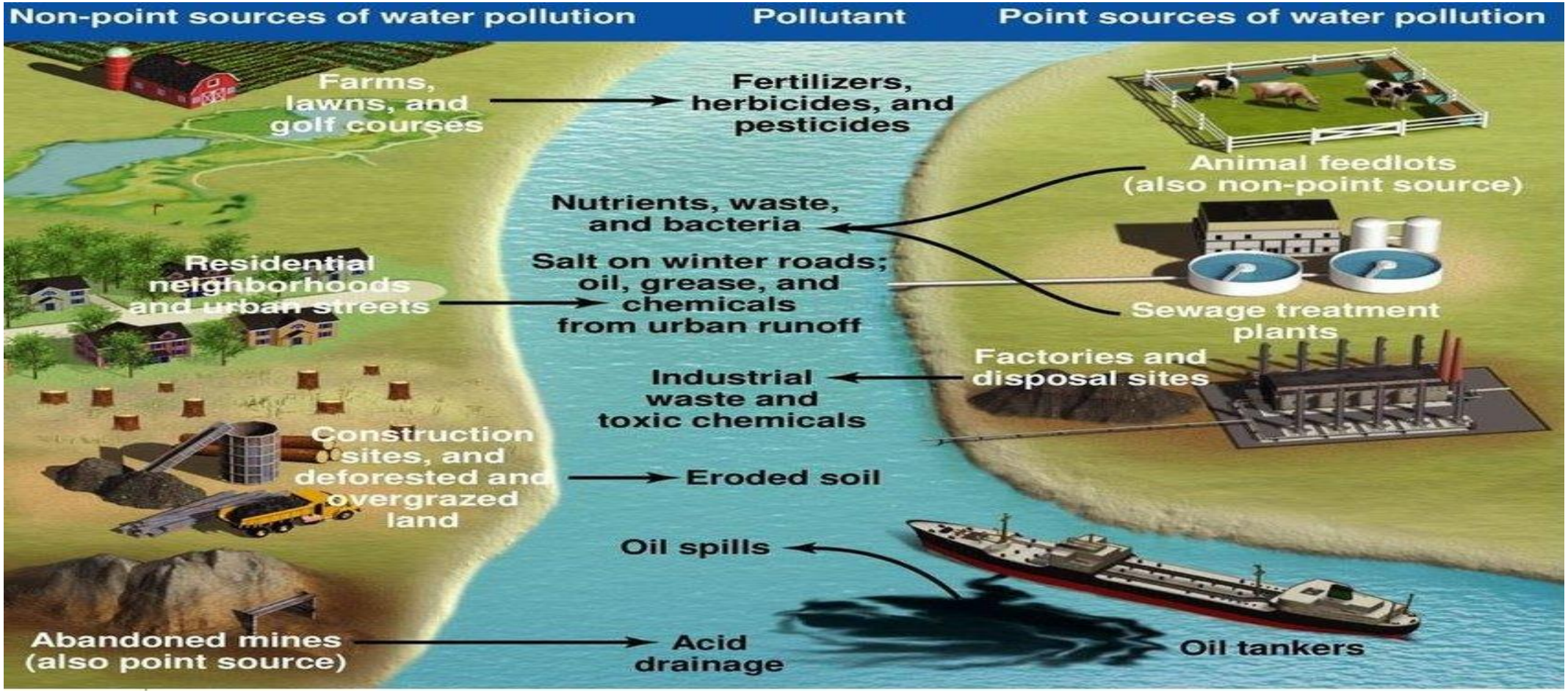
C) Microbiological – Fungus, bacteria, virus.

Turbidity



- **Turbidity** is the cloudiness or haziness of a fluid caused by large numbers of individual particles that are generally invisible to the naked eye.
- As smoke is in air, turbidity is in water.
- Turbidity in water is given by various materials like suspended solid, dissolved materials and microbial loads.
- Turbidity indicates the presence of foreign materials in water. So if water is turbid it is not suitable for drinking purpose. Some materials that give turbidity may be toxic to consumers. Therefore turbid water is not suitable for drinking purposes. Furthermore turbidity decrease efficiency of disinfection process.
- The EPA Interim Primary **Drinking Water** Regulations recommend that **turbidity** of a potable **water** be less than 1 unit and less than 5 units under special conditions.

Sources of water pollution



Effects of water pollution

- In humans, drinking or consuming polluted water in any way has many disastrous effects on our health.
- It causes typhoid, cholera, hepatitis and various other diseases.
- Ecosystems are extremely dynamic and respond to even small changes in the environment.
- Water pollution can cause an entire ecosystem to collapse if left unchecked.
- Chemicals in a water body, encourage the growth of algae. These algae form a layer on top of the pond or lake. Bacteria feed on this algae and this decreases the amount of oxygen in the water body, severely affecting the aquatic life there.
- Disruption in food chains happens when toxins and pollutants in the water are consumed by aquatic animals (fish, shellfish etc) which are then consumed by humans.

Eutrophication

Eutrophication is when a body of water becomes overly enriched with minerals and nutrients which induce excessive growth of algea.

This process may result in oxygen depletion of the water body.

Due to excessive green body on the surface of water the bacteria lives on the green algae.

These bacteria observe oxygen to live and due to this the amount of dissolved oxygen in water decreases.

Which ultimately cost the lives of aquatic animals .

Causes of Eutrophication

Fertilizers (nitrates and phosphates)

Eutrophication is predominantly caused by human action due to the dependence on using nitrate and phosphate fertilizers. This causes dense growth of algal blooms and plant life such as the water hyacinths in the aquatic environments.

Concentrated animal feeding operations

Concentrated animal feeding operations (CAFOs) are as well a main contributor of phosphorus and nitrogen nutrients responsible for eutrophication. The concentrated animal feeding operations normally discharge high scores of the nutrients that find way into rivers, streams, lakes and oceans where they accumulate in high concentrations thereby plaguing the water bodies by recurring cyano-bacterial and algal blooms.

Direct sewage discharge and industrial waste into water bodies

In some parts of the world, especially the developing nations, sewage water is directly discharged into water bodies such as rivers, lakes and oceans. As a result, it introduces high amounts of chemical nutrients thereby stimulating the dense growth of algal blooms and other aquatic plants which threatens survival of aquatic life in many ways.

Aquiculture

Aquiculture is a technique of growing shellfish, fish and even aquatic plants (without soil) in water containing dissolved nutrients. As a highly embraced practice in the recent times, it also qualifies a top ranking contributor to eutrophication.

If aquiculture is not properly managed, the unconsumed food particles together with the fish excretion can significantly increase the levels of nitrogen and phosphorous in the water thereby resulting in dense growth of microscopic floating plants.

Natural events

Natural events such as floods and the natural flow of rivers and streams can also wash excess nutrients off the land into the water systems thus causing excessive growth of algal blooms. Also, as lakes grow old, they naturally accumulate sediments as well as phosphorus and nitrogen nutrients which contribute to the explosive growth of phytoplankton and cyano-bacterial blooms.

Effects of Eutrophication

Threatens the survival of fish and other aquatic life forms

When the dissolve oxygen reaches Extreme levels, the animal and plant species under the water such as shrimp, fish and other aquatic biota suffocate to death. In extreme cases, the anaerobic conditions encourage the growth of bacteria that produces toxins which are deadly to the marine mammals. This can bring about aquatic dead zones, loss of aquatic life and it also lessens biodiversity.

Deterioration of water quality and limits access to safe drinking water

Algal blooms are highly toxic and once the water reaches the anaerobic conditions, the growth of more toxic bacterial is promoted. The consequence is extensive deterioration of water quality and decline in the availability of clean drinking water.

Poisoning and impact on human health

The Green Algae which generates red tide, release very powerful toxins with high poison levels in the water even at very low concentrations. The anaerobic conditions created by explosive plant growth in the water also results in the doubling of the toxic compounds. It can also cause death in humans and animals even at the least concentration when ingested in drinking water. The shellfish accumulate the poison in their mussles and then poisions humans upon consumption. High nitrogen concentraion in drinking water is associated with the ability of inhibiting blood circulation in infants.

Endangers fishing

One of the main characteristic of eutrophication is the increased growth of minute floating plants such as algae and photosynthetic bacteria and the development of extensive and dense mats of floating plants such as Nile cabbage and water hyacinths. Whenever this happens on a water body, fishing is endangered. It simply becomes difficult to set the fishing nets in water and the plants floating on water limits the mobility of boats and other fishing vessels.

Degradation of recreational opportunities

The main problem of eutrophication is the algal blooms and other aquatic plants that float on an extensive area of the water surface. It reduces the transparency and navigation in the water which lessens the recreational values and opportunities of the lakes, especially for boating and swimming. Nile cabbage, algal blooms, and water hyacinth can spread over an extensive area along the shores and can sometimes float over the entire surface into the land area.

Prevention of Eutrophication

Composting

Eutrophication mainly arises from the use of nitrate and phosphate fertilizers. In a bid to address the phenomenon, composting can be used as a solution. Composting is the practice of converting organic matter such as food residues and decaying vegetation into compost manure.

The nutrients present in the compost manure are deficient of the high concentration of nitrates and phosphates that feed the algae and other microbes in water bodies. In compost fertilizer, all the essential elements are broken down and synthesized by the plants thereby not creating the cycle of eutrophication. This method of controlling eutrophication is termed as nutrient limitation.

Reducing pollution

Just like composting, limiting pollution is an easy and effective method of cutting back on the amount of nitrogen and phosphates discharged into water systems. Big manufacturing companies and municipalities ought to reduce pollution and desist from discharging waste into water systems so as to reduce the amount of toxins and nutrients ending up in the waters that feed the algae and other microscopic organisms. If industries and municipalities can cap their waste discharge and pollution to a lower level, then nutrient content is reduced in the water systems which can subsequently control eutrophication.

Strengthening laws and regulations against non-point pollution

Strengthening laws and regulations against non-point water source pollution can substantially control eutrophication. According to EPA, non-point pollution presents the most serious challenge in the management of nutrient entry into water systems. Controlling nutrient sources therefore results in decreased eutrophication. By minimizing non-point pollution, we are essentially lessening the amount of nutrients entering the aquatic ecosystems. The laws should aim at enhancing high water quality standards and zero-tolerance to non-point solution. With the support of policymakers, citizens, pollution regulatory authorities and the government, it is easy to control eutrophication.

Ultrasonic Irradiation

The world is constantly seeking advanced methods for resolving some of the environmental problems. When it comes to eutrophication, the use of ultrasonic irradiation is one such mechanism which has been exploited as an alternative solution to control and manage algal blooming. The process works by causing cavitation which produces free radicals that destroy algae cells. Still, research is still underway to determine the uniqueness of its use in controlling the eutrophication problem.

Assignment.

1) what is turbidity ?what are its effects on drinking water quality.
2) Enlist the classification of water pollution?
3) What are the sources of water pollution? Discuss the effects of water pollution.
4) Write short note on Eutrophication.

- **Hard copy submission date (31/3/2020).**
- **Prepare one 100 pgs note book for the BCE Subject and write these daily assignments in it .**
- **Follow the submission deadline.**
- **If have any queries kindly contact.**
- **Phone number of faculty: - 8140140970/ 9023680060**