

Lecture 4: Hydrosphere Degradation: Pollutants in Aquatic Systems

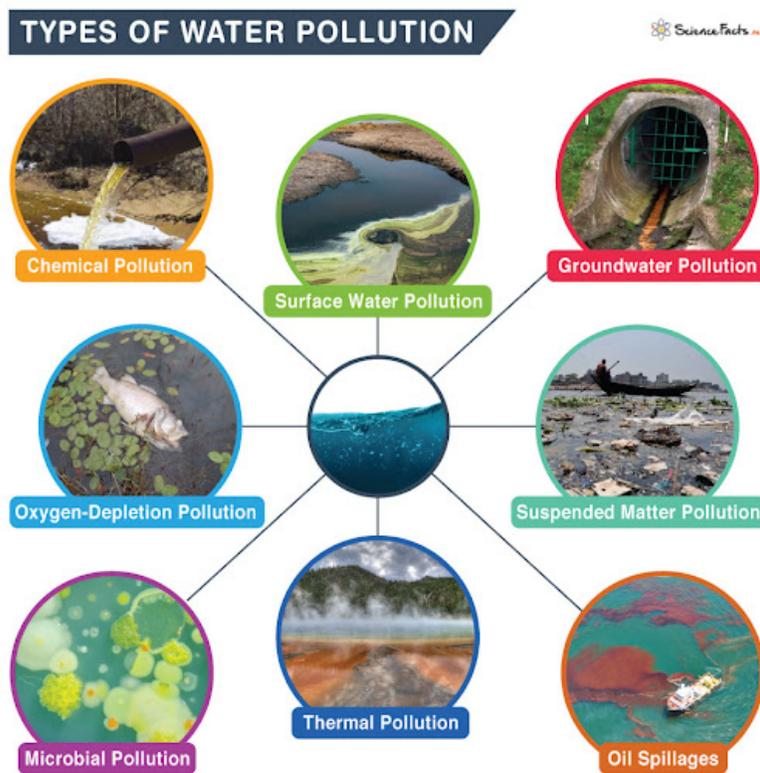
A Course in Fundamental of Pollution

Lecture 4: Hydrosphere Degradation: Pollutants in Aquatic Systems

Core Concept: The pathways and impacts of pollution in freshwater and marine environments, emphasizing the challenge of non-point sources.

(Introduction)

"Water is the universal solvent, which unfortunately makes it the universal sink for our waste. The degradation of aquatic systems follows distinct pathways, primarily distinguished by their source.



Point Source Pollution originates from a single, discrete location, such as:

- An industrial discharge pipe.
- A wastewater treatment plant outfall.
- An oil spill from a tanker.

These are often easier to identify, regulate, and treat.

The far more insidious challenge is **Non-Point Source (NPS) Pollution**. This is diffuse runoff from large areas of land, picking up and carrying pollutants as it flows. It includes:

- **Agricultural Runoff:** The largest source of NPS pollution, carrying fertilizers (nitrates, phosphates), pesticides, and eroded soil into waterways.
- **Urban Runoff:** From streets and rooftops, carrying oil, heavy metals (e.g., zinc from tire wear, copper from brake pads), road salt, and nutrients.



The consequence of nutrient-rich runoff is **eutrophication**. Excess nitrogen and phosphorus act as fertilizers for algal blooms. When these algae die, their decomposition by bacteria consumes dissolved oxygen, creating hypoxic 'dead zones' where aquatic life cannot survive. This lecture will also cover other aquatic contaminants, including pathogens from sewage, thermal pollution from industrial cooling, and the persistent challenge of acid mine drainage."