

Water Pollution

Water Pollution:

- any chemical, physical or biological agent added to water that decreases water quality and affects organisms

Two Main Causes:

- Industrialization: Developed countries
 - Dumping pollutants
- Rapid Population Growth: Developing countries
 - Sewage contamination – spreads disease

Two Types of Sources

- Point-source Pollution: pollution discharged from a single source
 - Factory
 - Wastewater treatment plant
 - Leaking oil tank

Iron Mine Pollution

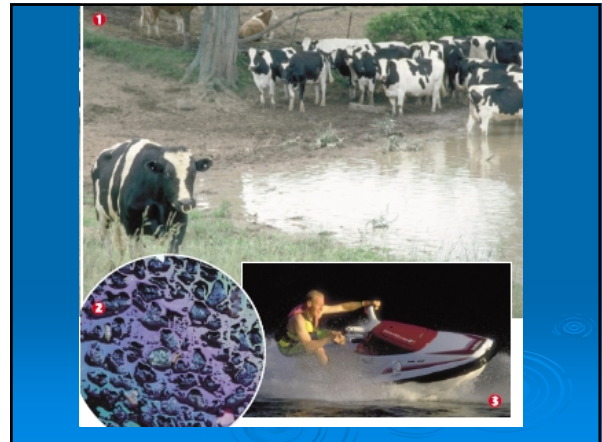


Oil leak into bay



Two Types of Sources

- Nonpoint-source Pollution: pollution from many different sources; hard to identify
 - Oil on street
 - Livestock polluting water holes
 - Boats
 - Lawn chemicals



Which type is more difficult to control?

- Non-point – enter water in many different ways
 - 96 % of pollution in US waters
 - Control depends on public awareness

Principal Water Pollutants

1. Pathogens: bacteria, viruses, protists, from sewage treatment plants, farms
2. Organic matter: animal/plant remains, feces, food waste from nonpoint sources

Principal Water Pollutants

3. Chemicals: pesticides, fertilizer, gasoline, acids, bases, industrial chemicals
from roads, factories, farms, lawns, landfills
4. Heavy metals: lead, mercury, arsenic
from industries, landfills, mining
5. Physical: Heat and suspended solids
from industries and soil erosion

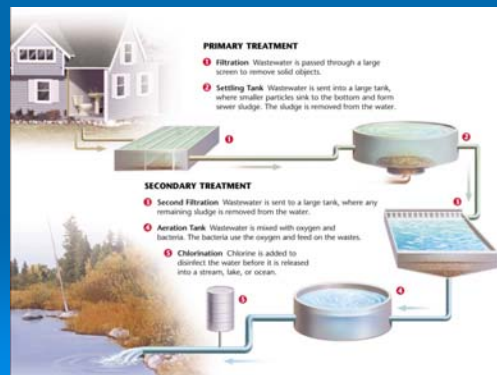
Wastewater

- Water that contains waste from homes/industries
- Leaves your house – goes to wastewater treatment plant – filtered and treated to return to lakes or rivers
- Treatment Plants use bacteria to break down biodegradable waste
- Can't remove toxic substances

Sewage Sludge

- Solid material that is left after treatment
- If contains toxic material, must be burned and ashes buried in landfill
 - If not toxic – fertilizer, bricks

Wastewater Treatment Process

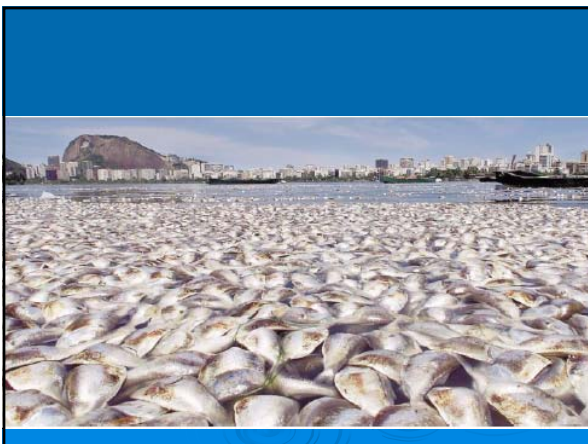


Artificial Eutrophication

- Natural Process: nutrients from dead plants, animal waste in lake
- More decomposition = less oxygen
- More plants grow – take over = marsh
- Artificial – caused by humans releasing phosphorus and nitrogen
 - Fertilizer, detergents

Eutrophication

Figure 18 In an effort to limit artificial eutrophication, some states have either banned phosphate detergents or limited the amount of phosphates in detergents.



Thermal Pollution

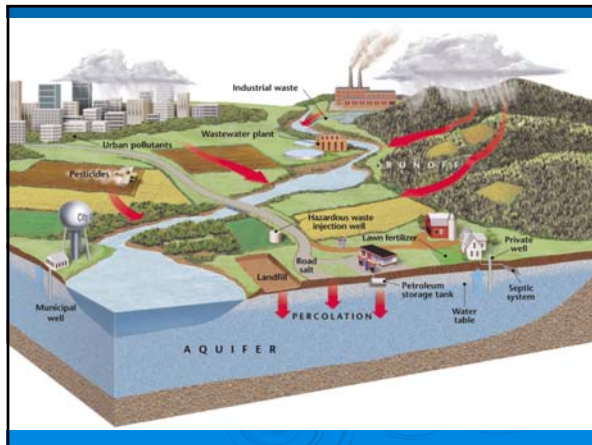
- Increase in the temperature of body of water
- Occurs when power plants/industries use water in cooling systems and discharge warm water into lake or river
- Can cause massive fish kills
- Increased water temp. = decreased oxygen = aquatic organisms suffocate

Massive Fish Kill



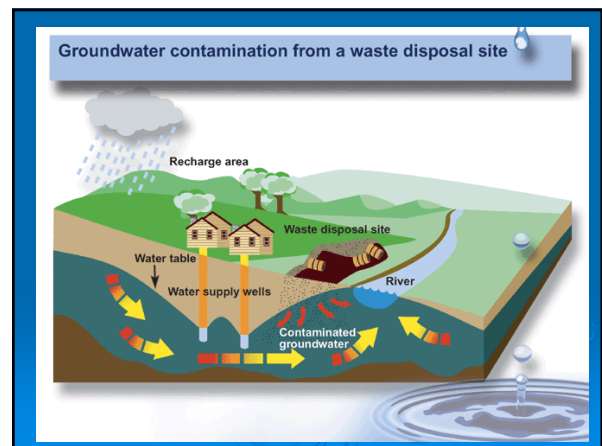
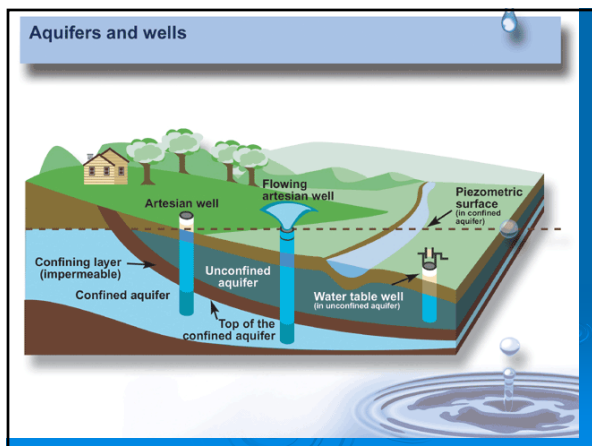
Groundwater Pollution

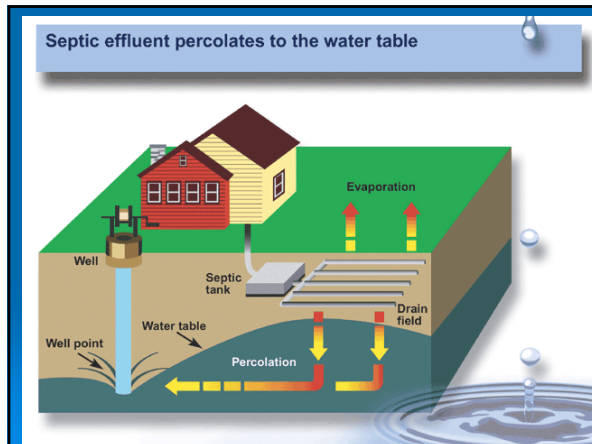
- Causes
 - Polluted Surface water percolating down
 - Pesticides, fertilizer, petroleum
 - Leaking underground storage tanks
 - Gasoline, heating oil, septic tanks



Groundwater Pollution

- Cleanup
 - Very difficult
 - Takes a long time for water in aquifer to recharge
 - Contaminants can still cling to rock, soil





Ocean Pollution

- Most often coastal areas
 - 85% of pollution comes from land
 - Oil, toxic waste, medical waste
- Polluted runoff into rivers eventually flows to the ocean
- Most affected ecosystems
 - Coral reefs, estuaries, coastal marshes

Exxon Valdez



Ocean Pollution

- Oil Spills
 - 1989 Exxon Valdez – Prince William Sound, Alaska
 - 37 million gallons/year of oil are spilled in accidents
 - More oil from land nonpoint sources
 - 200 million gallons/year

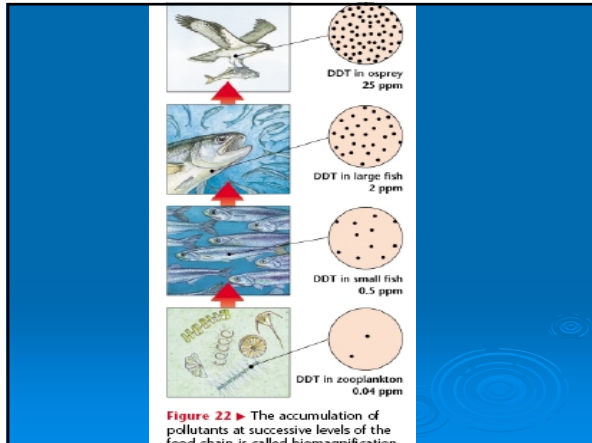
Effect of Water Pollution on Ecosystems

- Immediate damage:
 - Toxic spills kill all living things they contact
- Over time concentration of pollutants increases because they don't break down. This threatens the entire ecosystem.



Effect of Water Pollution on Ecosystems

- **Biomagnification:** accumulation of pollutants at successive levels of the food chain.
 - Example: small fish eat pollutant => small fish eaten by large fish=> large fish eaten by bird=> each organism is tainted.



Cleaning Up

- **Legislation**
 - Clean Water Act of 1972
 - Goal: restore US waters for fishing and swimming
 - Not achieved yet – 30% increase in clean lakes/ivers