

Water & Pollution



Water Resources

- Water is essential to life. Humans can live for more than month without food, but we can live for only a few days without water.
- Uses such as drinking and agriculture require freshwater (**less than 1%** of available water).



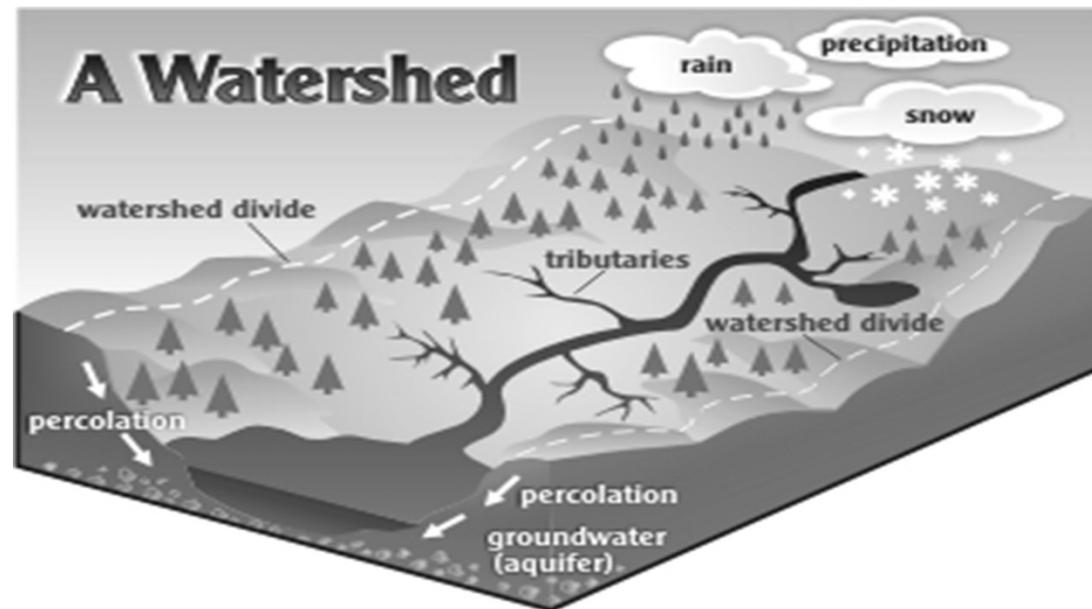
Surface Water

- **Surface water** is all the bodies of fresh water, salt water, ice, and snow, that are found **above the ground**.
- Throughout history, people have built cities and farms near reliable sources of water.



Watersheds

- A **watershed** is the area of land where all of the water that falls in it and drains off of it goes to a common outlet.
- The amount of water that enters a watershed varies throughout the year.

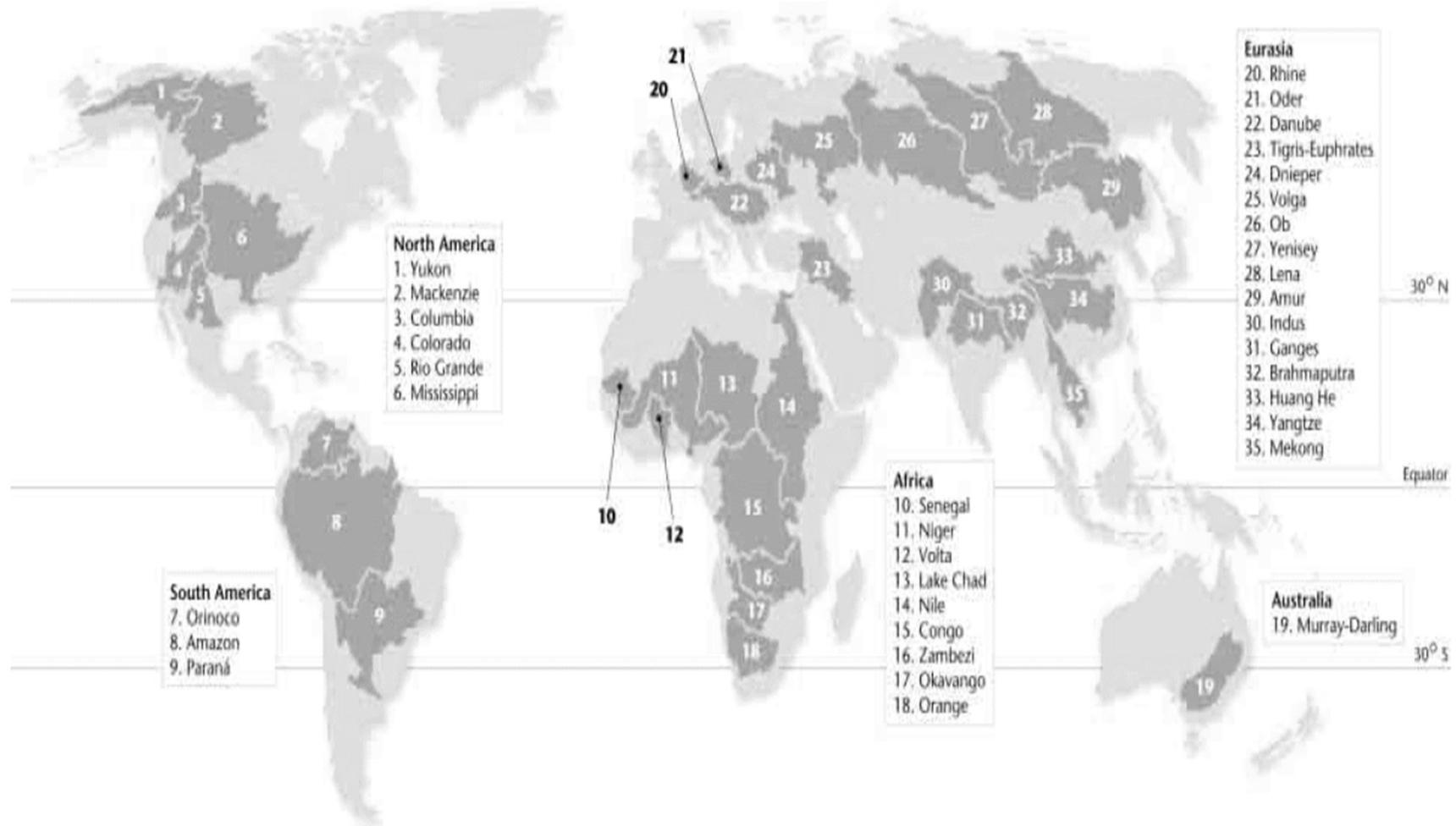


Our Local Watershed

- **Cobb County Water System** draws water from the **Chattahoochee Watershed**: Nickajack Creek, Rottenwood Creek, Sewell Mill Creek, **Sope Creek**, Sweetwater Creek, Willeo Creek.



Worldwide Watersheds



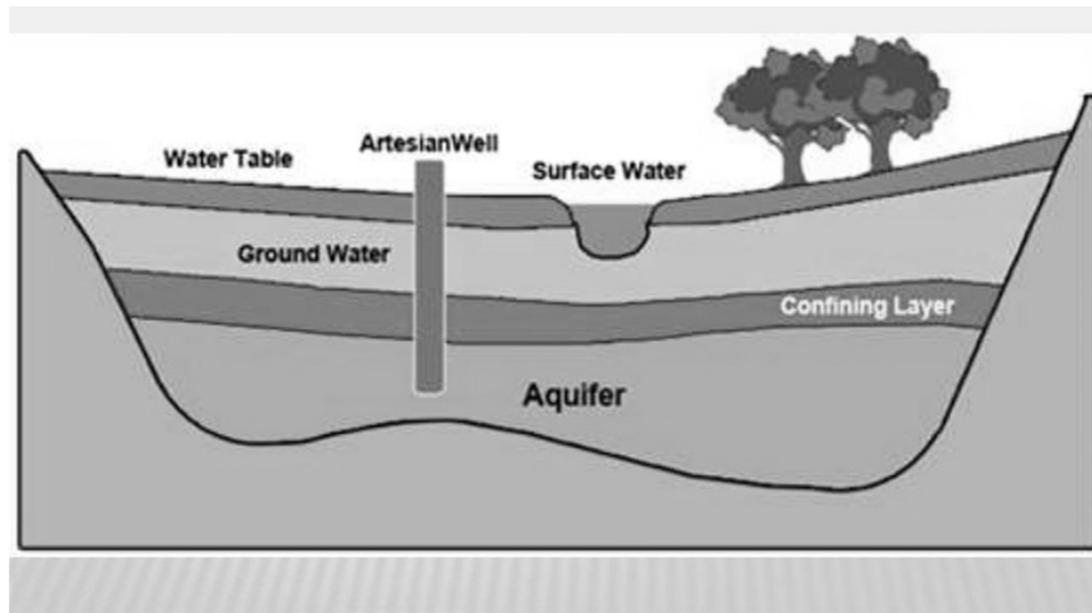
Groundwater

- **Groundwater** is the water that is beneath the Earth's surface.
- When it rains, some of the water that falls onto the land flows into lakes and streams. But much of the water flows through the soil and down into the rocks.



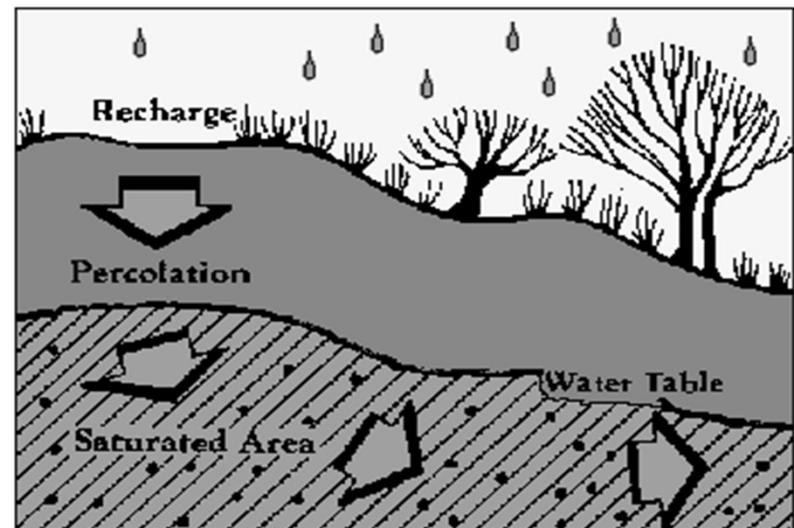
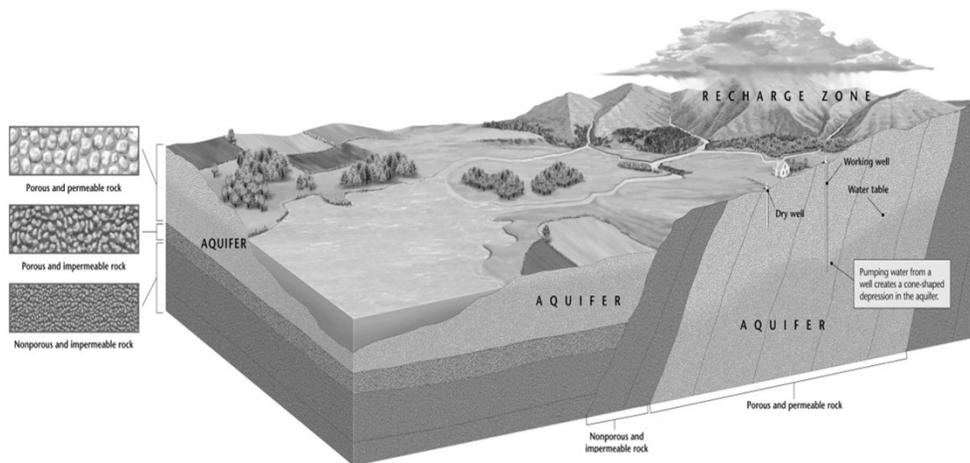
Aquifers

- An **aquifer** is a body of rock or sediment that stores groundwater and allows the flow of groundwater. They are important water sources.
- The **water table** forms the boundary.



The Recharge Zone

- To reach an aquifer, surface water must travel down through **permeable layers** of soil and rock.
- The **recharge zone** is an area in which water travels downward to become part of an aquifer.
- Recharge zones are **environmentally sensitive** areas because any pollution in the recharge zone can also enter the aquifer.



Wells

- A hole that is dug or drilled to reach groundwater is called a **well**.
- Humans have dug wells to reach groundwater for thousands of years.
- Water is **filtered** and **purified** as it travels underground.



REVIEW

1. What is a watershed? _____

2. Where does groundwater come from? _____

3. Why is a recharge zone environmentally sensitive? _____

4. What is a well? _____

Clean Water Availability

- When a water supply is polluted everyone living downstream can be affected.
- According to the World Health Organization (**WHO**), more than **1 billion people** lack access to a clean, reliable source of fresh water. This is one of the world's **biggest environmental problems**.



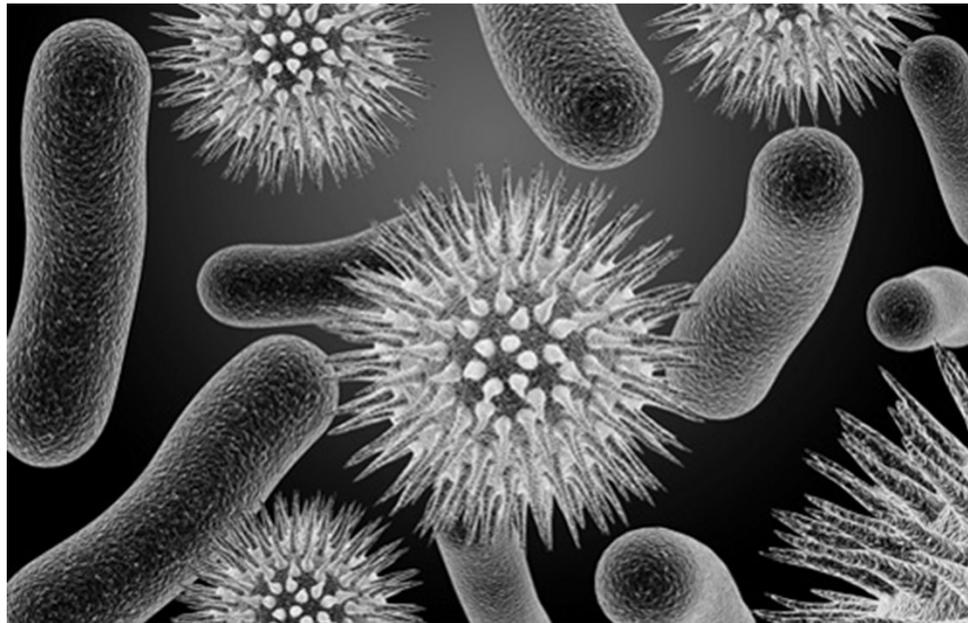
Water Treatment

- Water must be made **Potable** (Safe to drink).
- Water treatment removes elements such as **mercury, arsenic, and lead**, which are **poisonous** to humans.
- These elements are found in polluted water, but they can also occur naturally.

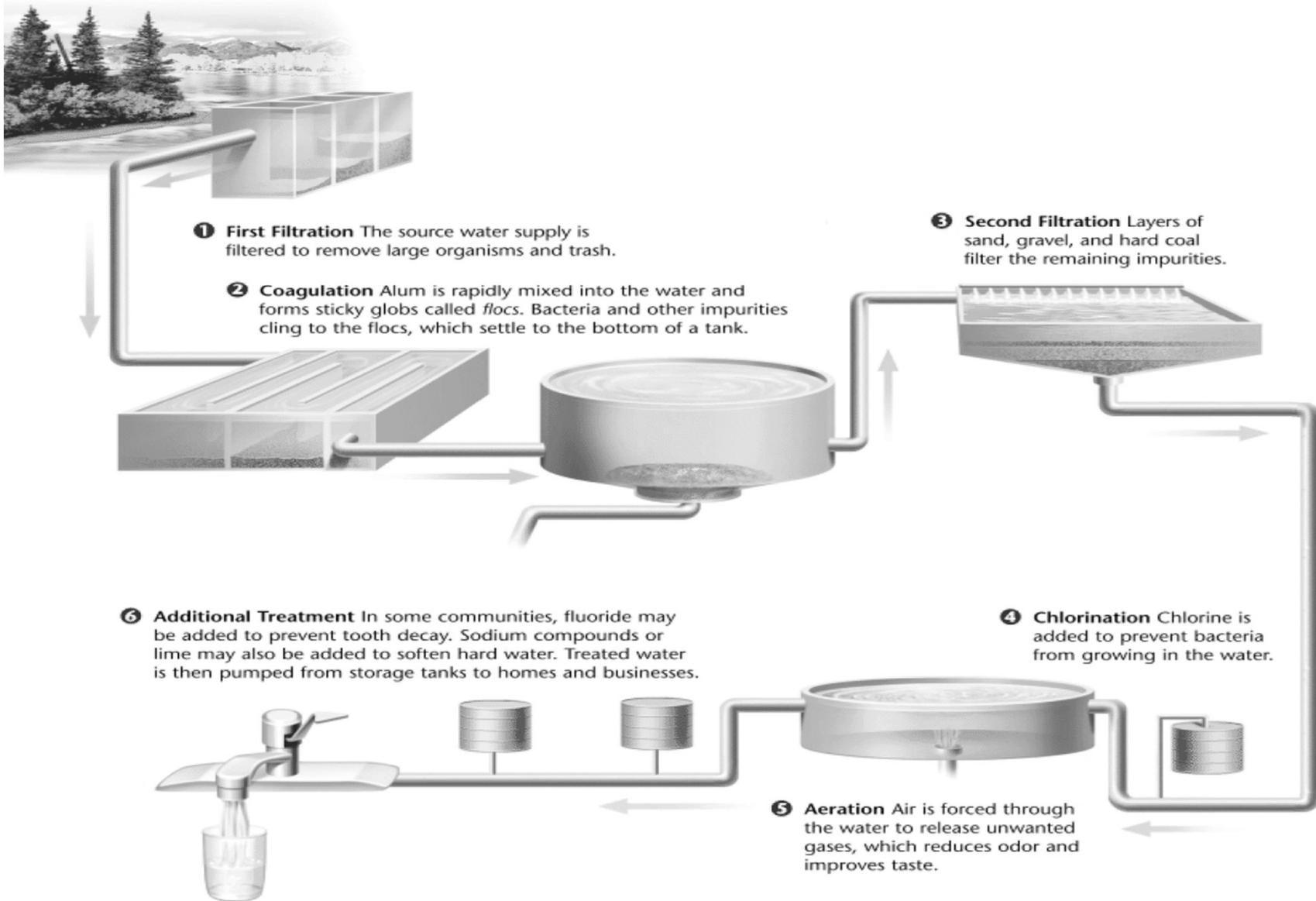


Water Treatment

- A **pathogen** is a **virus, microorganism, or** other substance that **causes disease**.
- Pathogens are found in water contaminated by **sewage or animal feces**, but can be removed with water treatment.



Drinking-Water Treatment



REVIEW

1. What does potable mean? _____

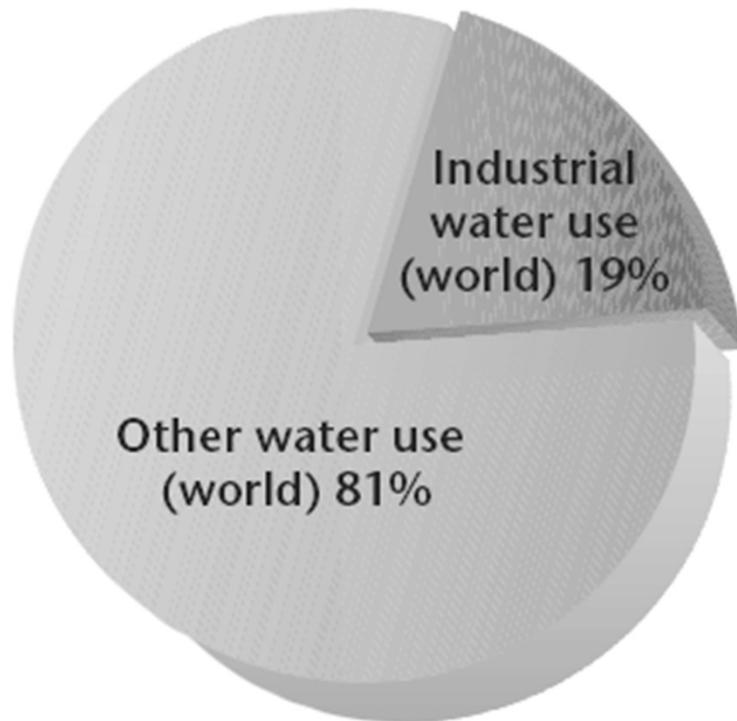
2. What elements that can be found in water are poisonous to humans? _____

3. What is a pathogen? _____

4. Describe the drinking water treatment process. _____

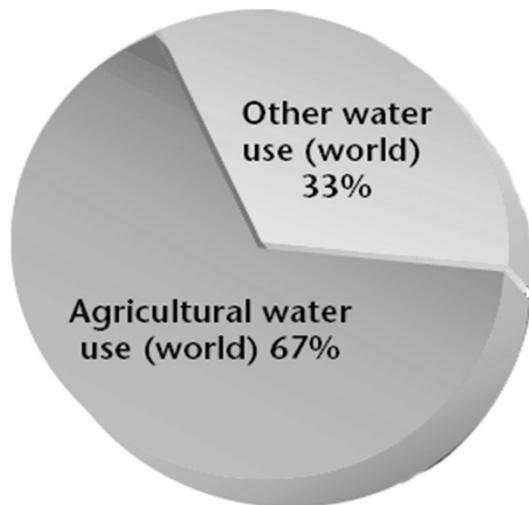
Industrial Water Use

- **Industry** accounts for **19%** of water used in the world. Water is used to **manufacture goods**, to **dispose of wastes**, and to **generate power**.



Agricultural Water Use

- **Agriculture** accounts for **67%** of the water used in the world. Plants require a lot of water to grow.
- **80%** of the water used in agriculture **evaporates**, never reaching the roots.
- **Irrigation** is a method of providing plants with water from sources other than precipitation.



Dams and Reservoirs

- A **dam** is a structure that is built across a river to control a river's flow.
- A **reservoir** is a body of water that forms behind a dam. Water from a reservoir can be used for **flood control, drinking water, irrigation, recreation, and industry.**
- **Hydroelectric dams** generate about **20%** of the **world's electrical energy.**



REVIEW

1. How does industry use water? _____

2. How much water is used in agriculture? _____

3. What is irrigation? _____

4. What is water in a reservoir used for? _____

Water Conservation

- As **water** sources become **depleted**, water becomes more **expensive**.
- Wells must be dug deeper, water must be piped further, and polluted water must be cleaned up before it can be used.
- **Water Conservation** is important.



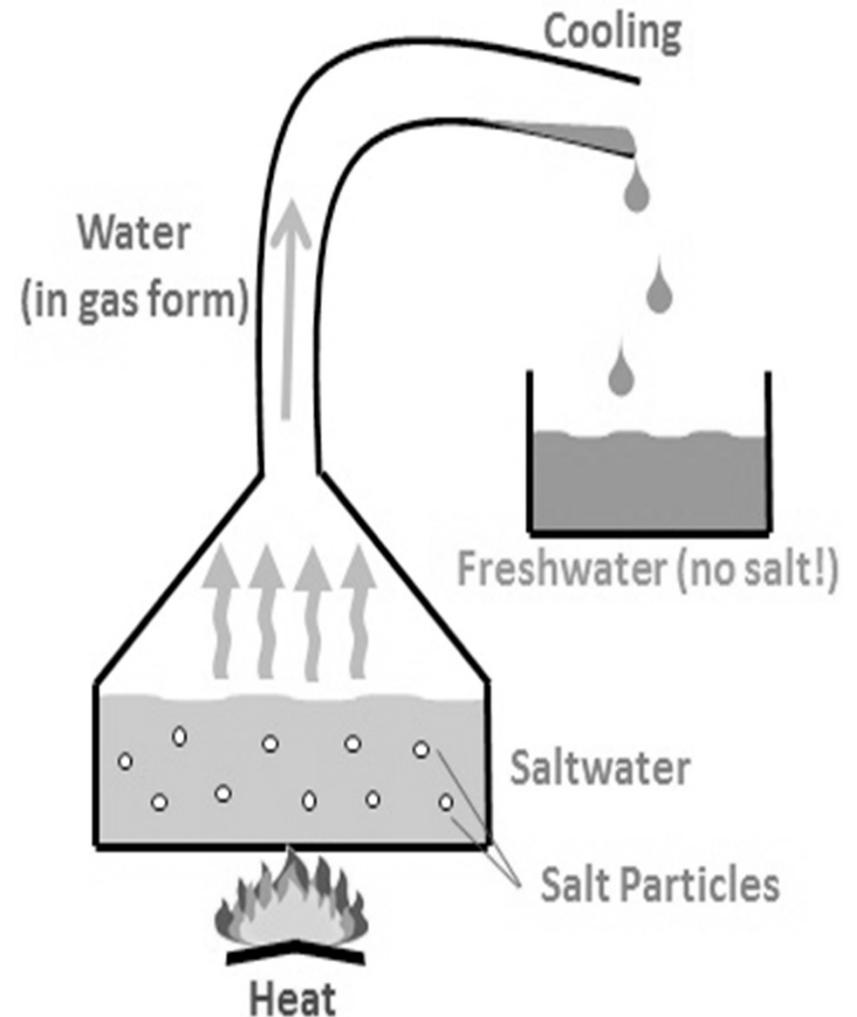
Water Conservation at Home

What You Can Do to Conserve Water

- Take shorter showers, and avoid taking baths unless you keep the water level low.
- Install a low-flow shower head in your shower.
- Install inexpensive, low-flow aerators in your water faucets at home.
- Purchase a modern, low-flow toilet, install a water-saving device in your toilet, or simply place a water-filled bottle inside your toilet tank to reduce the water used for each flush.
- Do not let the water run while you are brushing your teeth.
- Fill up the sink basin rather than letting the water run when you are shaving, washing your hands or face, or washing dishes.
- Wash only full loads in your dishwasher and washing machine.
- Water your lawn sparingly.

Desalination

- **Desalination** is the process of **removing salt** from ocean water.
- Desalination plants in some drier parts of the world **heat salt water** and **collect the fresh water** as it **evaporates**.
- Consumes a lot of **energy** and is very **expensive**.



REVIEW

1. What are some ways that we can conserve water? _____

2. Describe the desalination process? _____

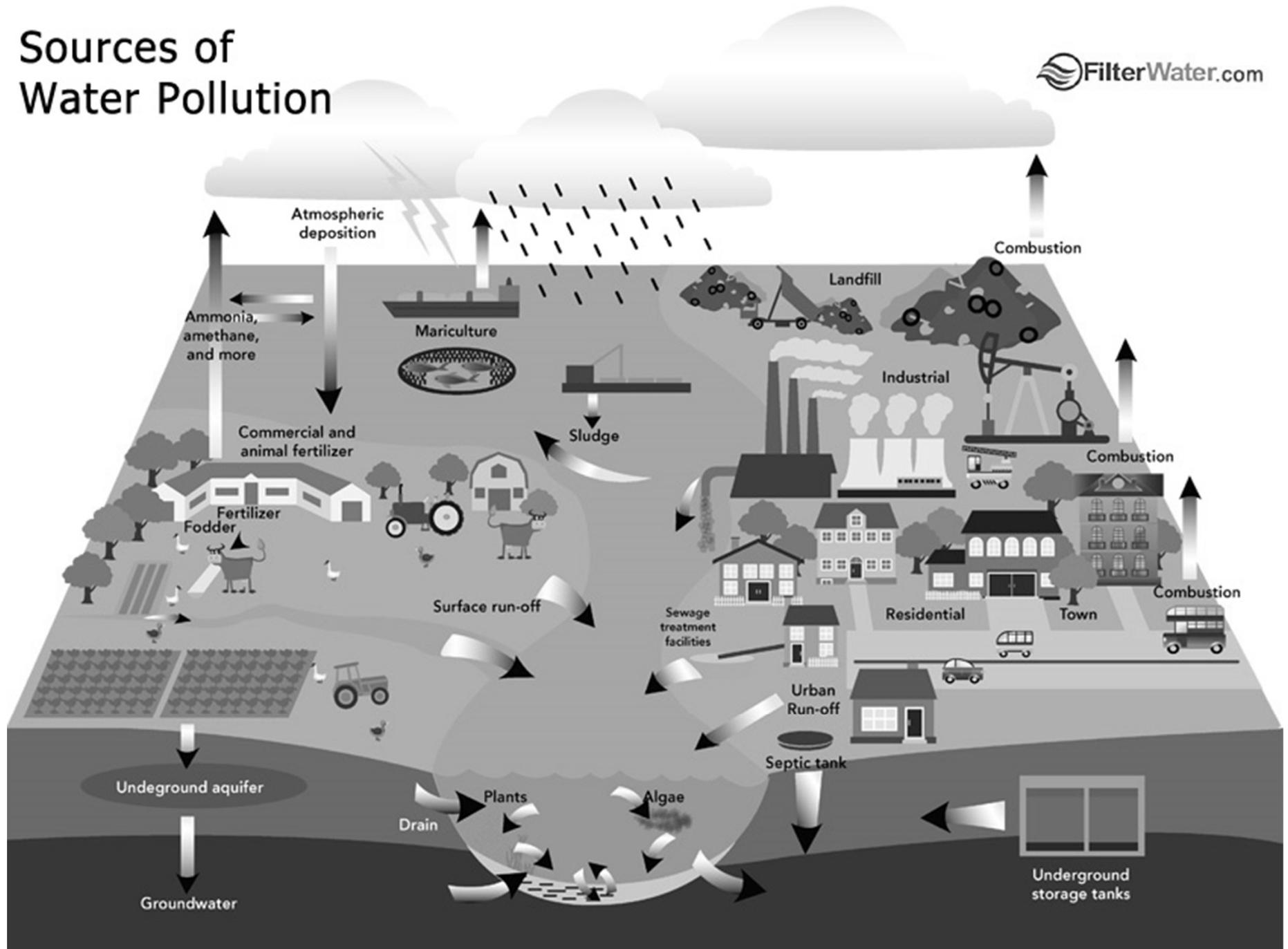
3. What are the drawbacks to desalination? _____

Water Pollution

- **Water pollution** is the introduction of waste matter or chemicals that are **harmful** to organisms into water resources.
- The two main causes of water pollution are **industrialization** and **rapid human population growth**.
- Sources of water pollution: human wastewater, agriculture, industry, mining, development, and pharmaceuticals – **human activities on land**
- Not all countries have infrastructure to treat wastewater.



Sources of Water Pollution



Sources of Water Pollution

- **Point-source pollution** is pollution that comes from a specific site. Examples: a factory, a wastewater treatment plant, or a leaking oil tanker
- **Non-point source pollution** is pollution that comes from many sources rather than from a single specific site. Examples: oil from cars on streets and fertilizers from farms



Point and Nonpoint Sources Examples

Sources of Point Pollution

- leaking septic-tank systems
- leaking storage lagoons for polluted waste
- unlined landfills
- leaking underground storage tanks that contain chemicals or fuels such as gasoline
- polluted water from abandoned and active mines
- water discharged by industries
- public and industrial wastewater treatment plants

Nonpoint Sources of Pollution

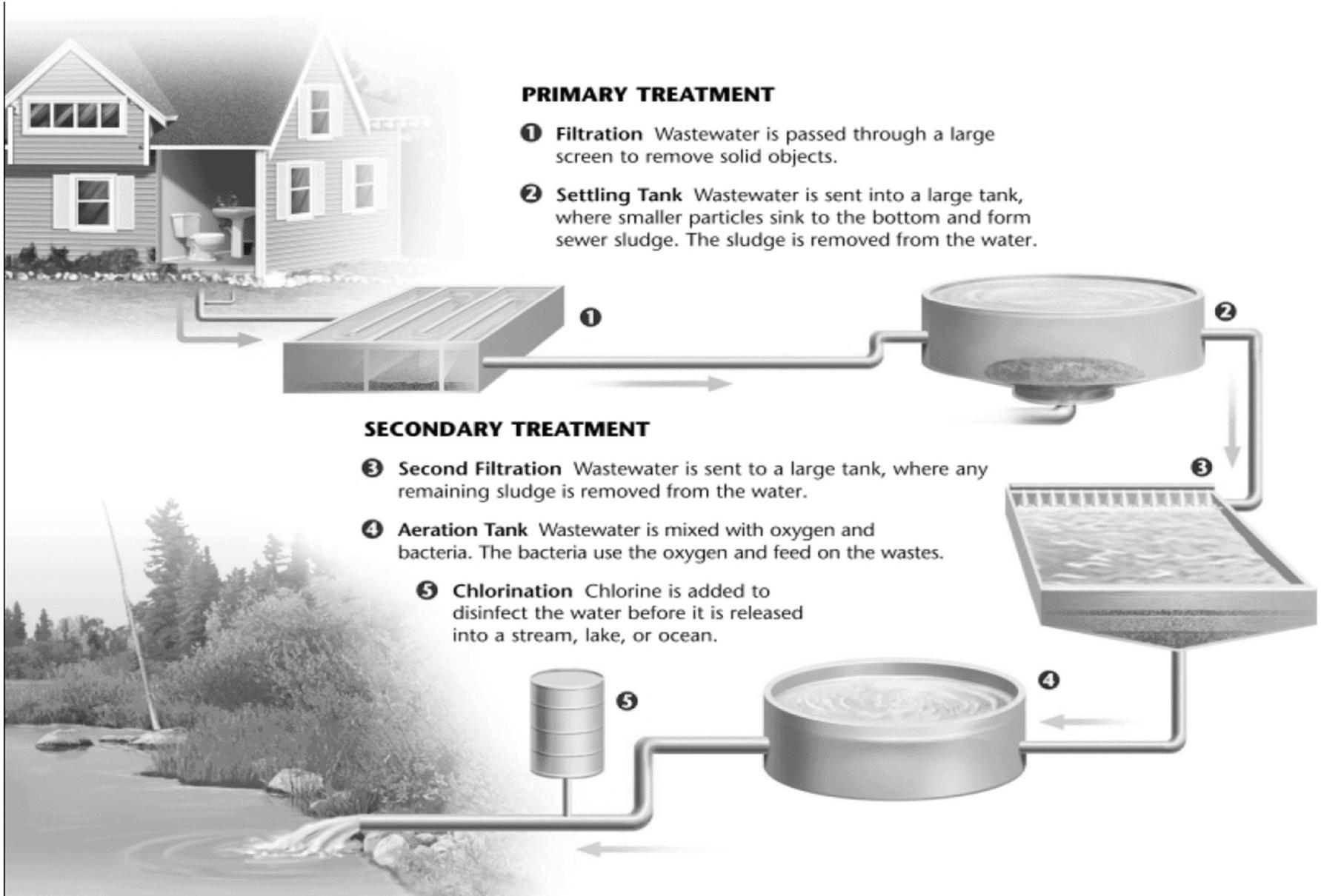
- chemicals added to road surfaces (salt and other de-icing agents)
- water runoff from city and suburban streets that may contain oil, gasoline, animal feces, and litter
- pesticides, herbicides, and fertilizer from residential lawns, golf courses, and farmland
- feces and agricultural chemicals from livestock feedlots
- precipitation containing air pollutants
- soil runoff from farms and construction sites
- oil and gasoline from personal watercraft

Wastewater

- **Wastewater** is water that contains wastes from homes or industry.
- After water flows down the drain in the sink, it flows through **sewage pipes** that carry it to a **wastewater treatment plant**.
- Water is then **filtered** and treated to make the water clean enough to **return** to a river or lake.



Wastewater Treatment Process



Old Infrastructure

- Older parts of our **infrastructure** can become overwhelmed with large storms and **untreated sewage** may be released into the environment.
- According to the EPA, sewage overflows happen about **40,000 times** per year in the United States.



Sewage Sludge

- **Sewage sludge** is the **solid material** that remains after wastewater treatment.
- It contains **toxic** chemicals and must be disposed of as **hazardous waste**. It is often **incinerated** (burned), and then the ash is **buried** in a landfill.
- It is an **expensive** process and a large burden in many communities.



REVIEW

1. What are some sources of water pollution? _____

2. What is wastewater? _____

3. Describe the wastewater treatment process. _____

4. Why is sewage sludge a problem? _____

Groundwater Pollution

- Pollutants usually enter groundwater when polluted surface water percolates down below.
- **Common Pollutants:** pesticides, herbicides, chemical fertilizers, and petroleum products
- **Sources of Pollution:** septic tanks, unlined landfills, and industrial wastewater lagoons.

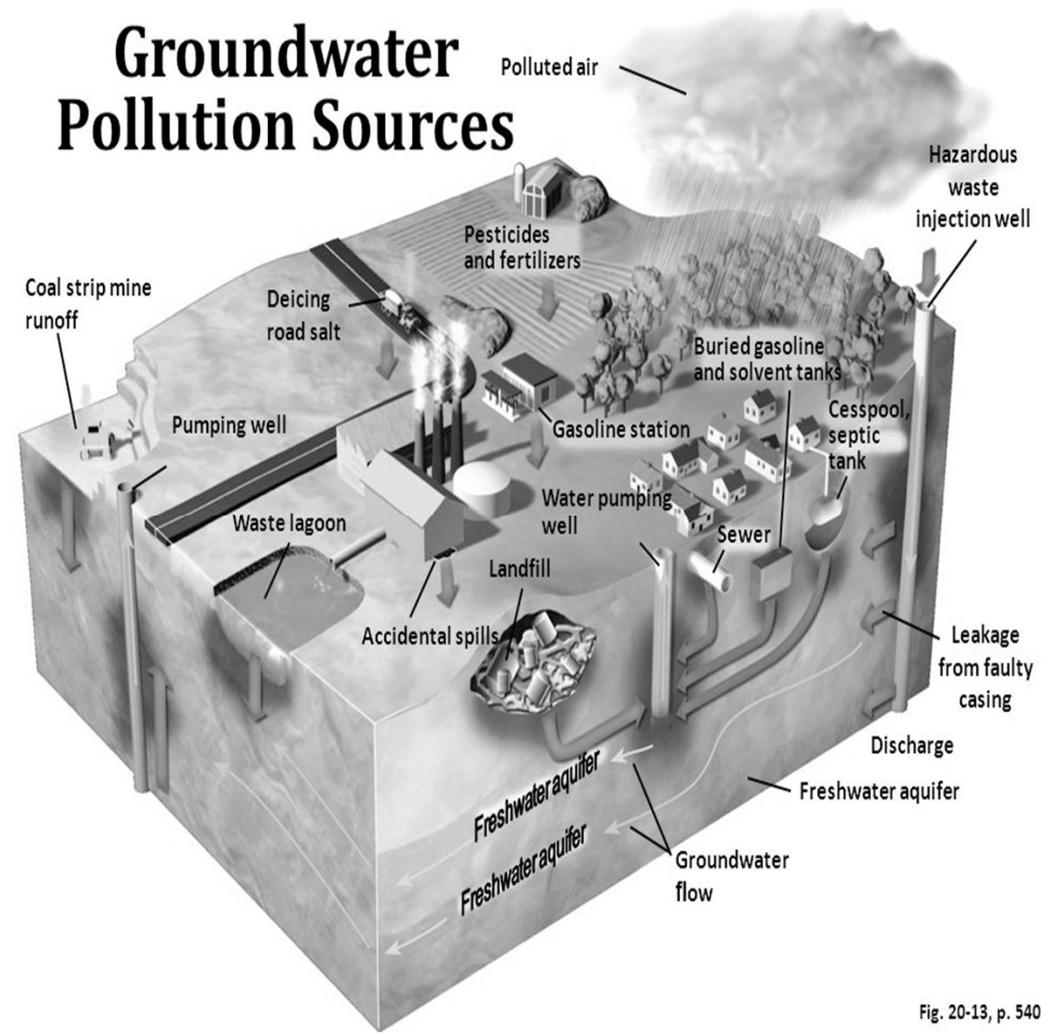
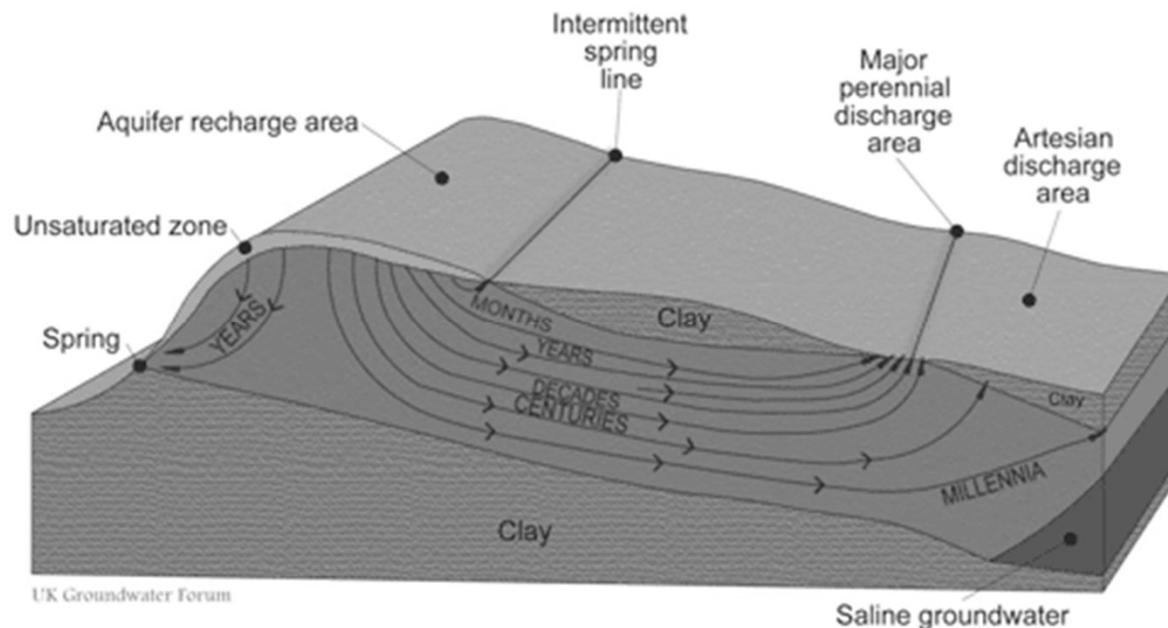


Fig. 20-13, p. 540

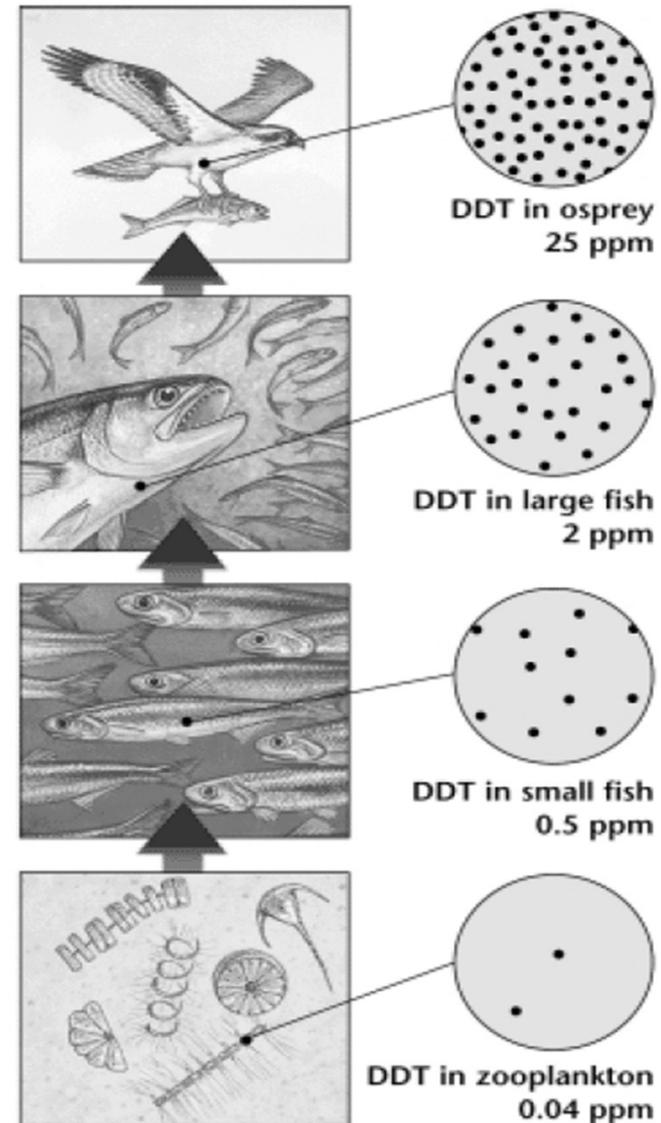
Cleaning Up Groundwater Pollution

- **Groundwater pollution is one of the most challenging environmental problems.**
- Pollution clings to the materials of an aquifer. The process to recycle water and purge contaminants can take **hundreds of years**.



Water Pollution and Ecosystems

- Water pollution can cause immediate and long term damage to ecosystems.
- **Biomagnification** is the accumulation of pollutants at successive levels of the food chain. Most harmful at the **top**.
- U.S. limits the amount of fish people can eat from certain bodies of water.



Cleaning Up Water Pollution

- **The Clean Water Act of 1972** was designed to “restore and maintain the chemical, physical, and biological integrity of the nation’s waters.”
- The percentage of lakes that are **safe** for swimming has **increased by 30 percent**.



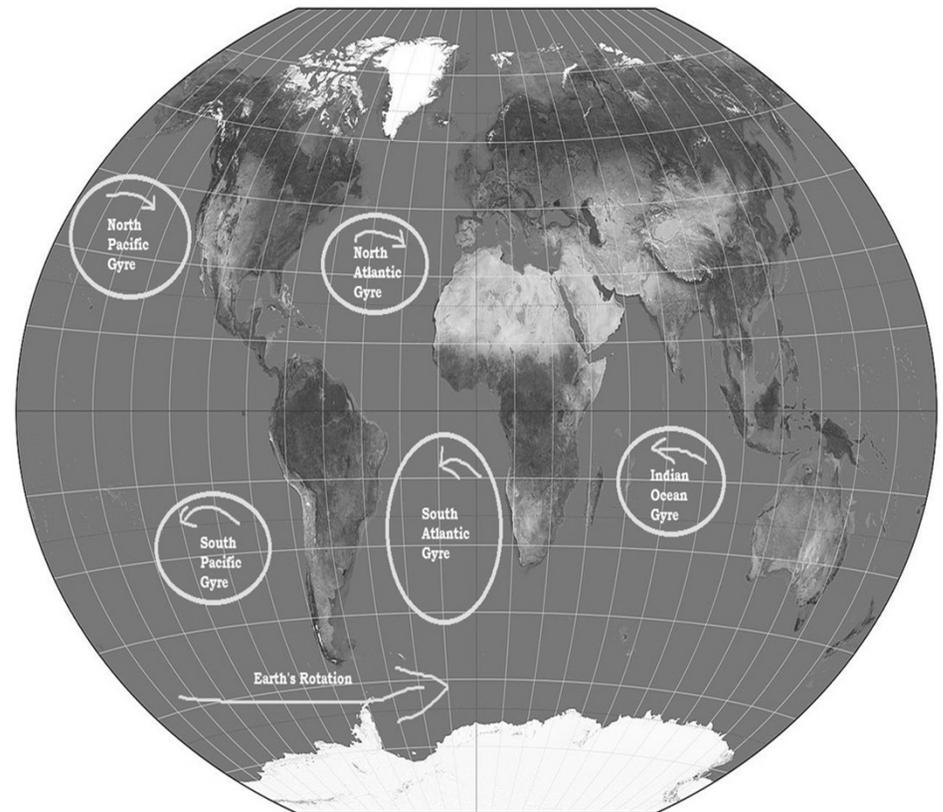
Global Water Pollution

- The oceans are a **global common**
- **Human activities on land** increase water pollution.
- This impacts all life in the oceans.



Ocean Garbage Patches

- Garbage patches are collections of marine garbage. (mostly **plastic**)
- A **Gyre** is a system of circulating currents in an ocean that causes the debris to accumulate.
- The **Great Pacific Garbage Patch** is the **largest** garbage patch. 700,000 sq. km. - 15,000,000 sq. km. (about the size of Russia)



REVIEW

1. What are some sources of groundwater pollution? _____

2. Why is it difficult to clean up groundwater pollution? _____

3. What is biomagnification? _____

4. What causes the ocean garbage patches? _____
