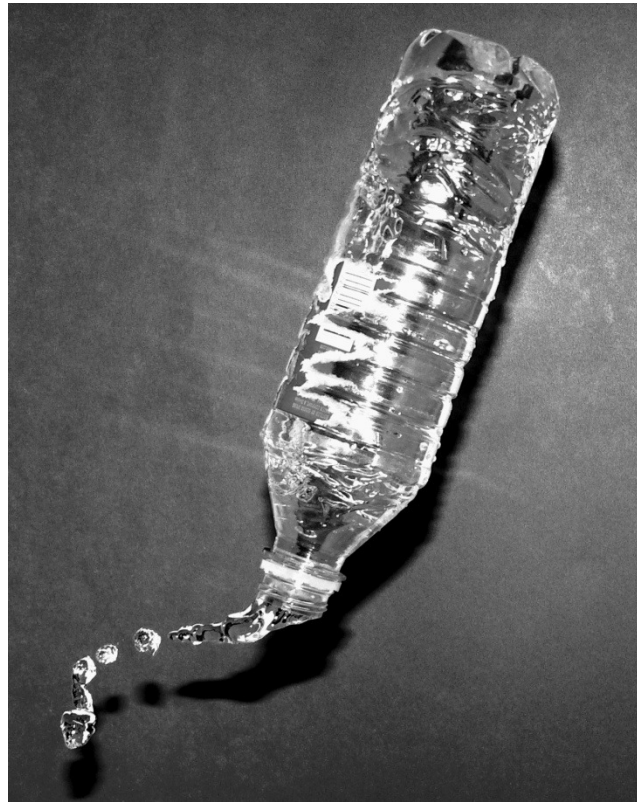


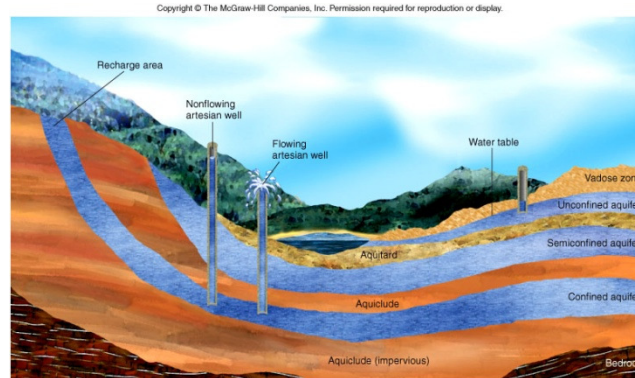
Cary Institute Changing Hudson Project

Bottled Water: What's the problem?



Where does your water come from?

- Groundwater



- Reservoir



- River

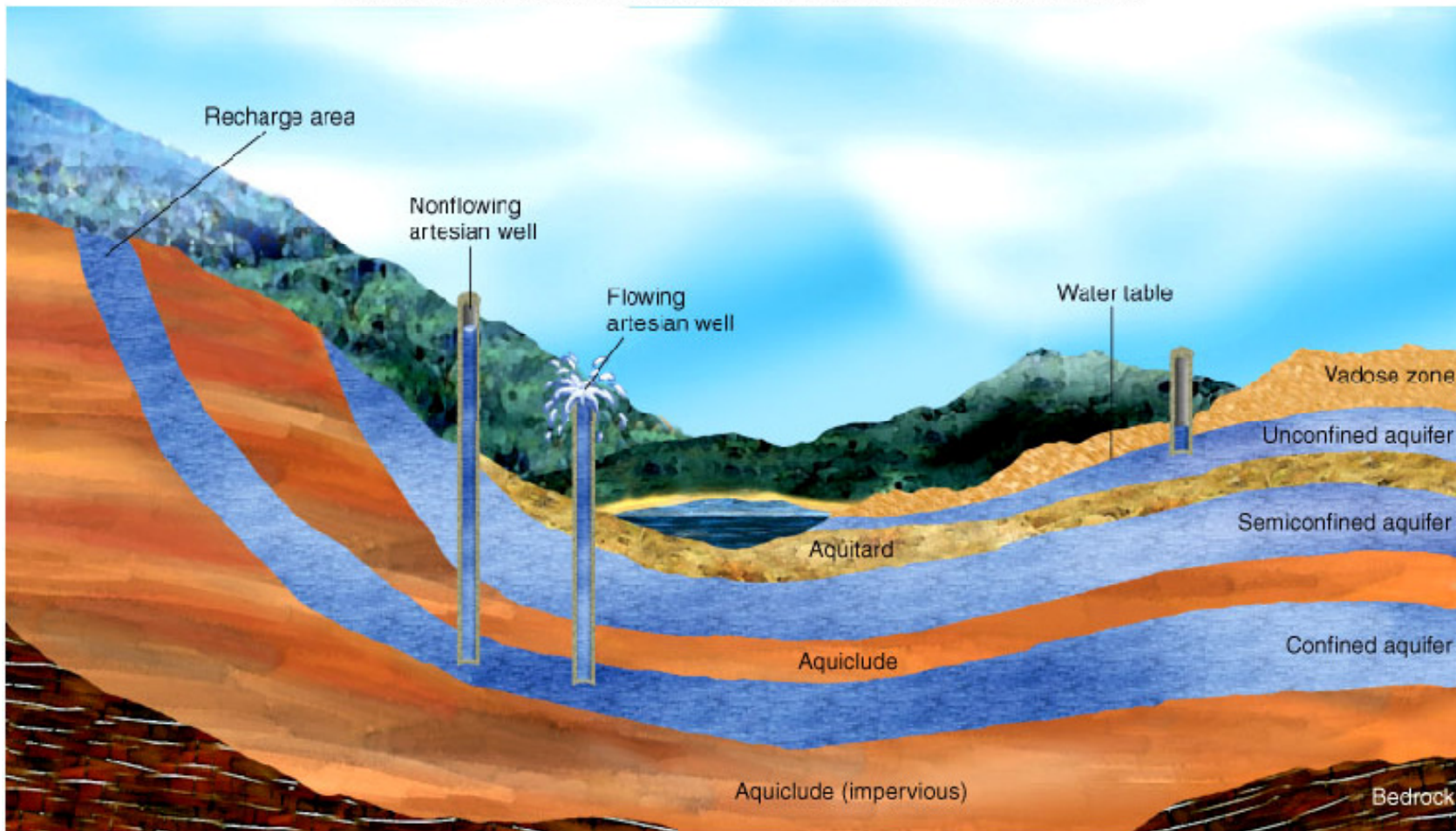


What is groundwater?



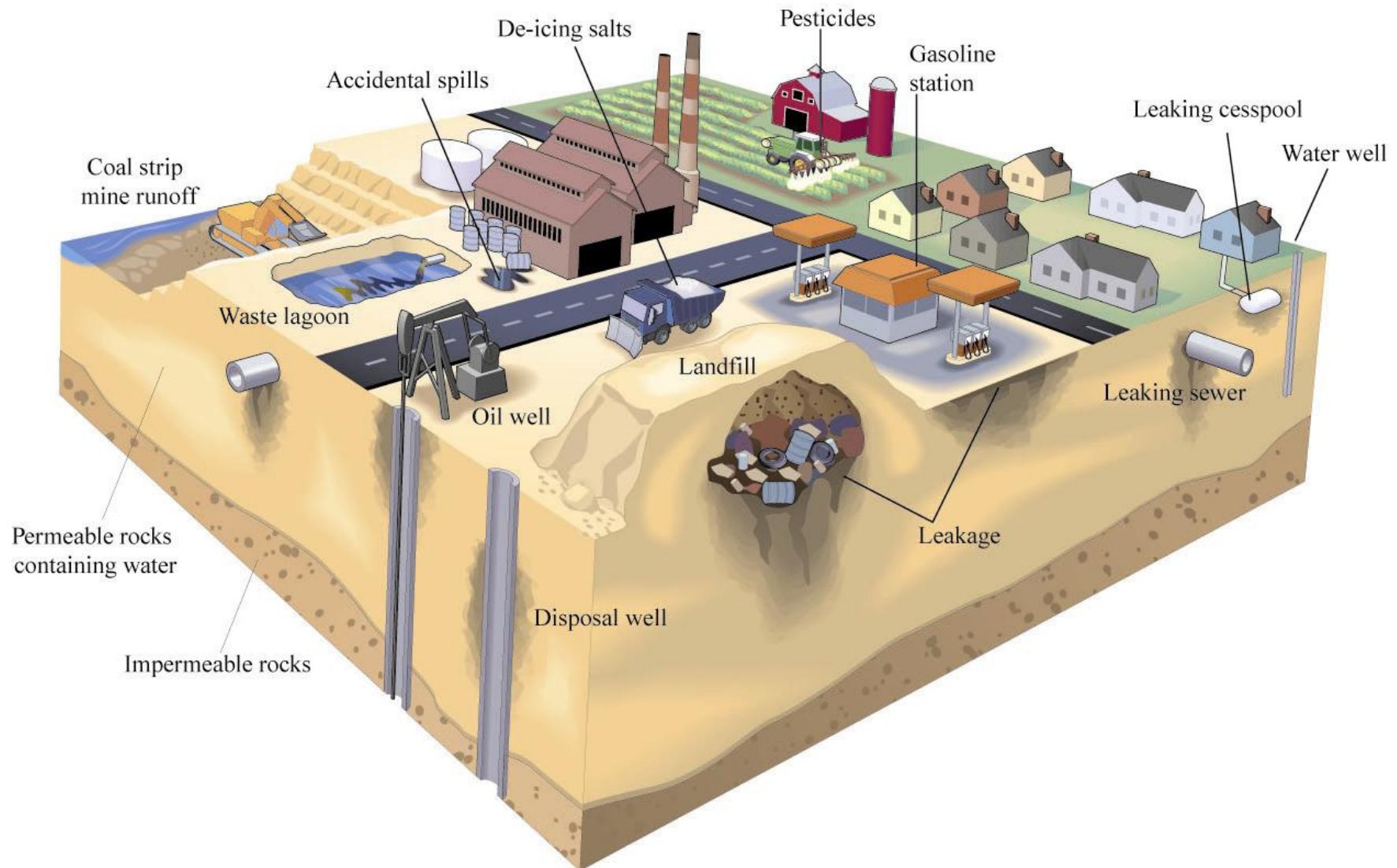
Aquifers and Groundwater

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Groundwater: any water that is found underground in cracks and spaces in soil, sand, and rocks

Sources of Groundwater Contamination



Groundwater Pollution

- Major Sources:
 - Agricultural Products
 - Pesticides
 - Runoff from sewage lagoons
 - Underground Storage Tanks (sewage)
 - Leakage
 - Industrial Processes
 - Runoff from detergents, factory effluent
 - Road salt
 - Landfills
 - Approximately 90% North American landfills have no liners to stop leakage.

Groundwater Mining

- Removing water from an aquifer faster than it can be replenished.
 - Extended periods of mining can lead to:
 - Land subsidence.
 - Lowering of the water table.
 - Salt-water intrusion of wells near coastal areas.
- More than half of the US relies on groundwater for drinking water (New York: 35%)



Santa Cruz River,
south of Tucson
Arizona in 1942
and 1989.



Tucson's water table
has dropped 200
feet due to
population
increases, mining,
and agriculture.



Ogallala Aquifer

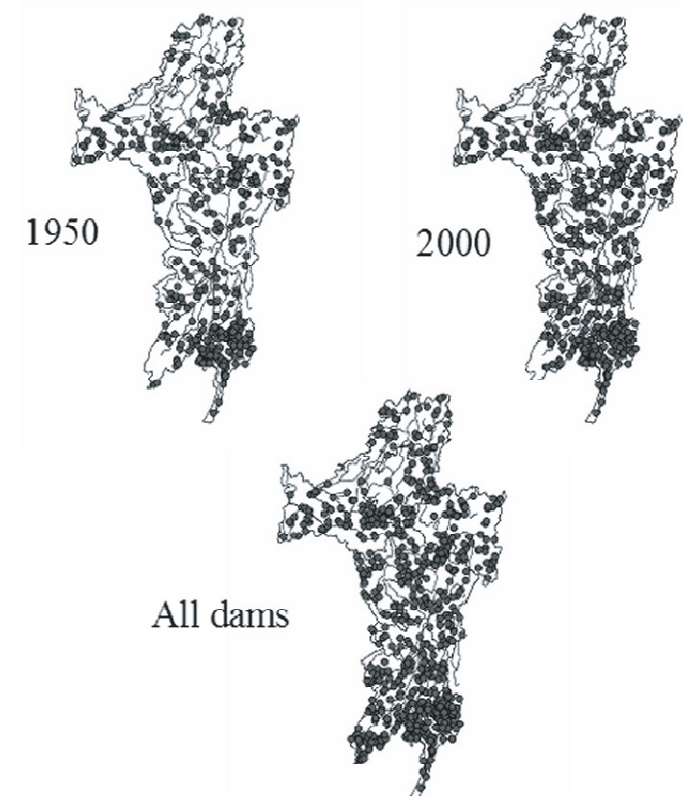
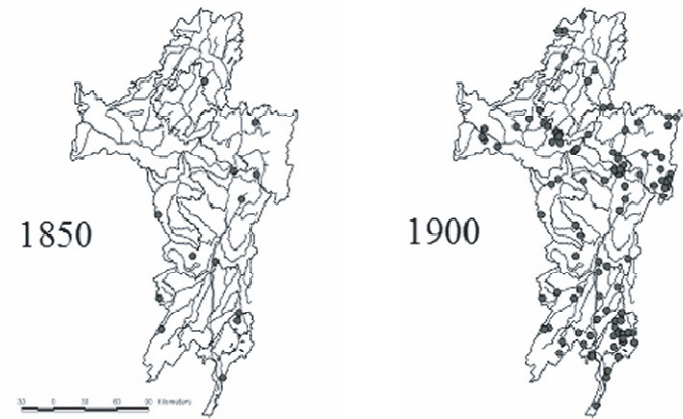


Ogallala Aquifer

- Before 1940s, water couldn't be accessed if it was below 70-80 feet
- Technology allowed wells to extract water from more than 3,000 feet
- By 1990, sixteen million acres of the high plains were irrigated with water from Ogallala
- Farmers grow corn, wheat, alfalfa, livestock
- Some areas: more than 150 foot declines

Reservoirs

- Reservoirs are created by damming a river
- The Hudson River watershed has over 800 recorded dams



Dams

- Although hydroelectric dams control flooding and create electricity, they have drawbacks.
 - High construction costs.
 - Habitat destruction (above and below dam)
 - Impedes fish migrations
 - Slows down stream flow and silt deposition
 - Impounded water has elevated evaporation rate
 - Slows down scouring effects of flooding.

New York City's Water Supply: Reservoirs in the Catskills and Croton



Reservoirs: Newburgh, Beacon, Kingston



Newburgh & Beacon use a combination of groundwater and reservoir sources; above is Mt. Beacon reservoir



Kingston uses Cooper Lake as a reservoir

River: Many Mid-Hudson Cities and Towns use the Hudson River as their water supply



Poughkeepsie,
Wappingers
(currently using
Poughkeepsie
water),
Rhinebeck,
Waterford, Port
Ewen and
Highland

Aquifers: Croton-on-Hudson, Millbrook, many smaller municipalities



Pump for the Village
of Croton-on-
Hudson

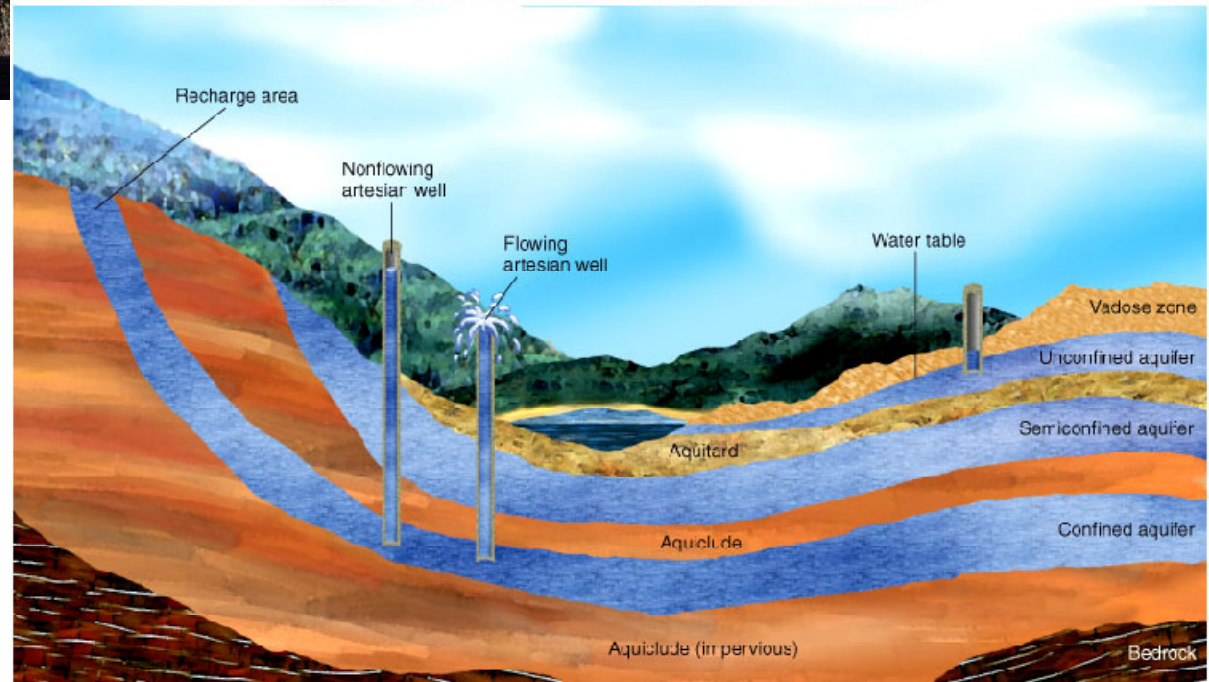


Millbrook, NY

In rural areas, each homeowner probably has a well



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Bottled Water



- 1978: 415 million gallons
- 2001: 5.4 billion gallons (43 billion sixteen-ounce bottles)... An increase of 1300%

Bottled Water: The Basics

Q: Where does bottled water come from?

A: 40% is 'purified' from tap or groundwater

Artesian Water/Artesian Well Water is water drawn from a confined aquifer where water under pressure rises above the water table.

Spring Water can be collected only at the spring or from a bore hole adjacent to the spring that taps the aquifer feeding the spring. The properties of the water drawn from the bore hole must be the same as that of the water in the spring.

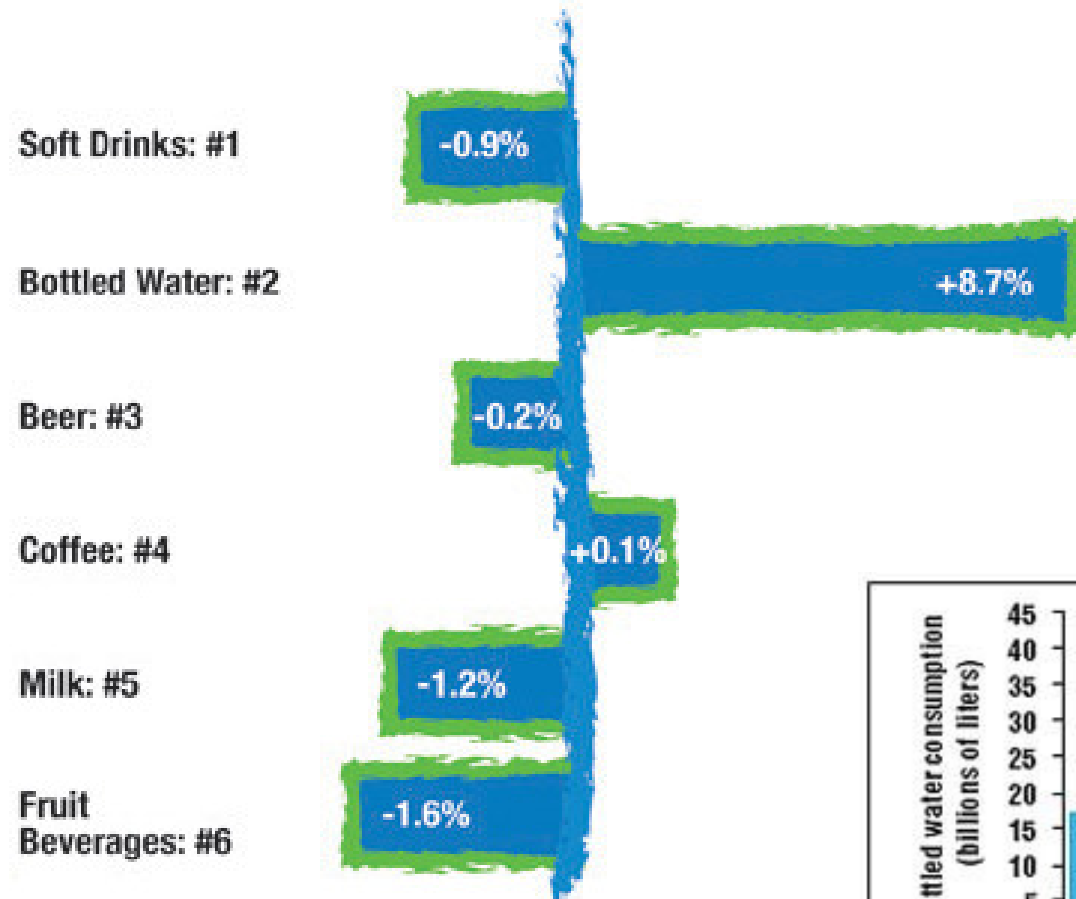
Well Water derives from a hole bored or drilled that taps the water of an aquifer. This water must be pumped to the surface.

Purified Water is produced through distillation, deionization, reverse osmosis or some other water treatment process. This water originates as either tap water or groundwater. Other names include distilled water, purified drinking water, distilled drinking water and deionized water.

Mineral Water contains more than 250 ppm of total dissolved solids (FDA standard) which are present at the point of emergence from the source. No minerals can be added to this water nor can it be drawn from a municipal source.

2006 Sales Volume Trends

Category & 2006 Rank Percent of Volume Growth



The
industry
has grown!

Source: Beverage Marketing Corporation, 2006

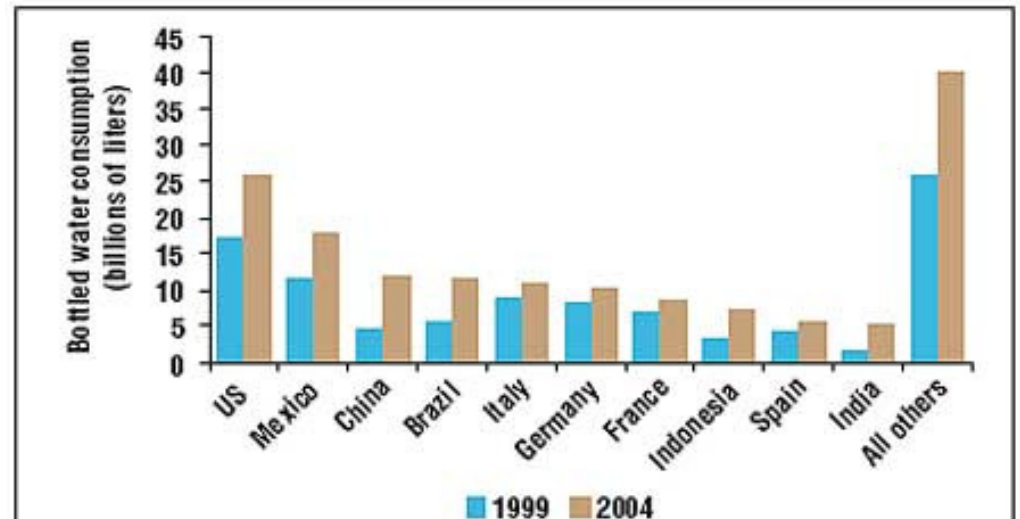
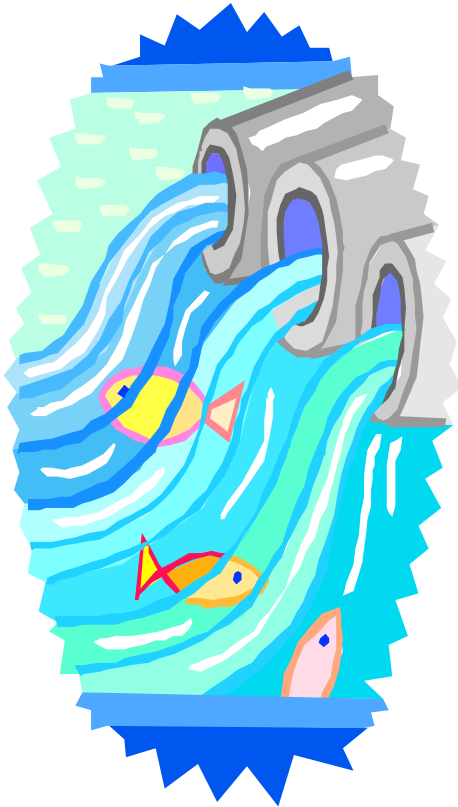


FIGURE 1. Total bottled water consumption among 10 countries. Source: Beverage Marketing Corporation

Bottled Water: the basics

- EPA regulates tap water, while the FDA regulates bottled water
- EPA regulations are stricter than those set by the FDA
- Bottled water costs thousands of dollars more than tap water per unit volume
- Negative effects of the bottled water industry:
 - demand for oil to create plastic bottles
 - oil to ship bottled water
 - lack of recycling
 - negative community and ecosystem impacts

Bottled water: Ecological Consequences



- More than half of bottled water comes from groundwater aquifers
- Reduces amount of water for rivers and lakes
- Reductions cause an increase in temperature in rivers, less water for spawning fish and other species
- More significant impacts over the long term

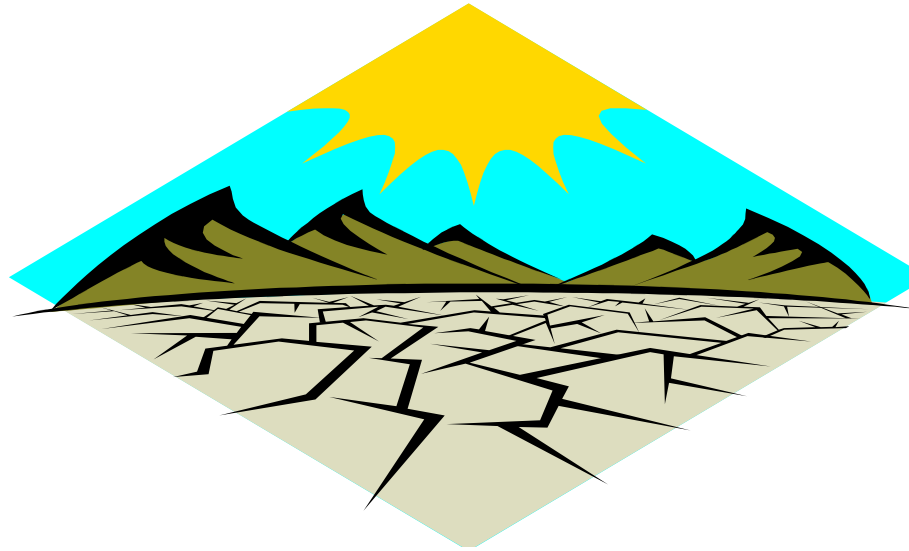
Bottled water: Economics

- Consumer price for 20 oz. bottle of Aquafina water purchased individually = **\$1.50**
- Consumer price for 20 oz. bottle of Stop & Shop water purchased in bulk = **\$0.21***
- Consumer price for 20 oz. tap water = **\$0.0004**
- \$1.50 spent on tap water gives you the same amount of water as nearly 3,500 bottles of water (20 oz. bottles)



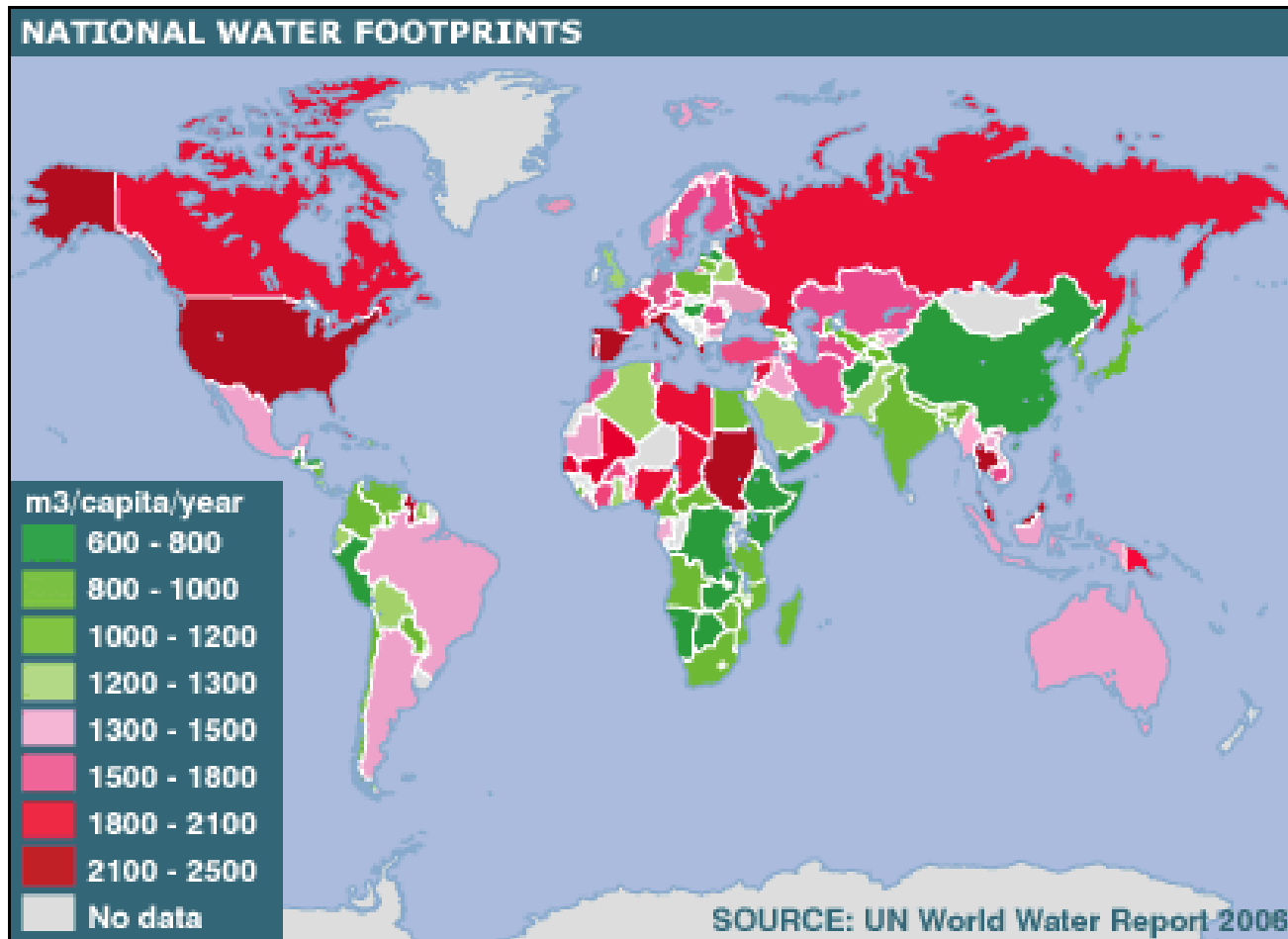
Bottled Water: Social concerns

Over one third of the world faces serious water shortages



The US: uses up to 100 times the amount of water per capita compared to some developing countries, and over twice the amount of even the most industrialized countries (UNEP)

Water 'Footprint'



Bottled Water: Environmental Concerns

- The oil used to produce the water bottles for the US each year is 1.5 million barrels- enough to fuel about 100,000 US cars for a year.
- Globally, 2.7 million tons of plastic are used to bottle water per year
- Transportation for the water and the bottles! Do we really need water from France...?



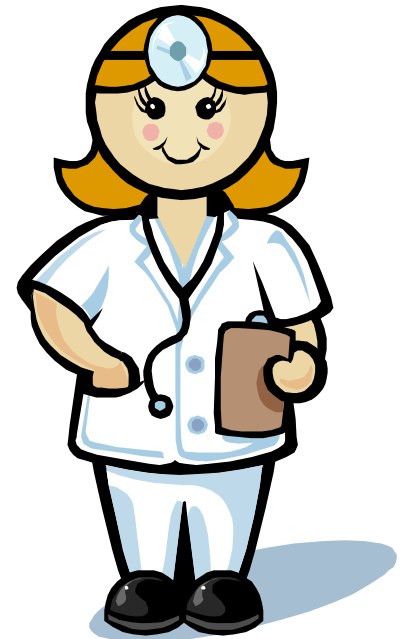
Bottled Water: Environmental Concerns

- 86% of plastic water bottles in the US become garbage or litter
- When burned: the bottles emit toxic materials such as chlorine gas and ash containing heavy metals.
- In a landfill: the bottles can take up to a millennium to biodegrade



Bottled Water: Health concerns

- Lining for some cans, durable plastic bottles may cause developmental problems
- Contaminants in drinking water exist in both bottled and tap water
- The FDA requires less frequent testing by the bottled water industry than by municipal water treatment plants, and the industry is not required to make public its water testing results



Bottled Water: What to do

- Know where your water comes from: make an educated decision
- Re-use your water bottle or buy a durable water bottle
- Use a water cooler
- Recycle your plastic bottles
- If necessary, purchase a permanent water filter for your home

