

# Groundwater Contamination

By Christine McLelland

**Topic:** Groundwater contamination by underground storage tanks.

**Grade Level:** 6-12

**Content Standard:** Earth and Space Science

**Content Objective:** To understand the effects of leaking tanks and release of contaminants on our groundwater resources.

**Time Required:** 30-40 minutes depending on reading abilities

**Materials Needed:** No additional materials needed

**Directions:** Students can read instructions together out loud and then read the articles to themselves. Explain that the students are to find the cause of the pollution, effect of the contamination, solution to the present contamination, and prevention of future contamination referred to in each article. They should put the answer to each in the section of oval under the appropriate article. If the articles have the same answer, it should go in the part of the ovals that overlap. Each article does not necessarily address all four issues. There may be blanks! For example, both articles have the same cause, leaking underground storage tanks (USTs), so students should put that answer in the overlapping area of the ovals across from 'Cause'. However, the Cape Cod article also discusses contamination from dumping and sewage systems, so these answers would go in the part of the oval under Cape Cod Article.

A good groundwater demo would be in order if you have the materials. For example, using an acrylic groundwater box (rectangle with a drain hole in one side) with gravel and sand in it, fill partially with water and make a 'pond' by moving sand aside in the middle (add enough water to fill the pond but not go above the rest of the sand and gravel). Put some food color drops on the gravel on the side opposite the plugged drain. Have students watch the food color spread down and into the groundwater. Then pull the plug on the other end. The food color will very rapidly move toward the drain and into the pond. The pond will quickly fill with the food coloring and head out the drain. This will help students realize how pollution will move through groundwater.

## Lesson Plan Author and Contact Info:

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## Groundwater Contamination

Groundwater is one of our most valuable drinking water resources. It is also very important to many agricultural areas. Since it is filtered through the ground, it is often fresh and cold, and usually cleaner than surface water. Unfortunately, groundwater is threatened every day by people who do not even realize what it is or how they are affecting it. More and more states are adopting laws that govern sources of contamination, like storage tanks, but there is no national policy.

Storage tanks are used to hold all sorts of materials, but most often for gasoline, oil, or other hazardous chemicals. The tanks can be located above the ground or below ground. The latter is referred to as an underground storage tank or UST. They cause the most problems because, unless carefully monitored, leaks can go undetected for days or for months, until the contents of the tank have seeped into the ground. And where do the chemicals go? Often they seep right down into the groundwater, and can affect the drinking water of any nearby properties using it.

### ASSIGNMENT:

The following two articles are about two real problems with leaking storage tanks. Read the articles carefully and compare them. What is the cause of the pollution? What are some of the effects of this pollution? And how about a solution to the problem - can a spill be cleaned up? Are there ways to prevent further contamination? Keep these questions in mind as you read the articles. You will use a graphic organizer to analyze these ideas.

There are other sources of contamination of groundwater as well. For years, some industries would dump toxic wastes into ponds or swampy area, not realizing that the waste could eventually get into someone's drinking water. Some agricultural areas have trouble with pesticides and herbicides from farm runoff that seeps into the drinking water. Even sewage from toilets or livestock can contaminate water with dangerous bacteria.

Vocabulary List: Look up and understand these terms as you read:

toxic waste	aquifer	hazardous chemicals
plume	solvents	underground storage tanks (USTs)

## **Article #1**

### **TANKS A LOT!**

You can't see them. They're buried underground. But they're ready to cause havoc and fear among the populace. No, "they" are not zombies or the living dead in a horror movie. We're talking about the rusty, leaky, underground oil storage tanks found beneath towns and cities big and small throughout the United States. What's really scary is the fact that no one knows for sure how many of these tanks exist.

Whatever the number, it's clear these tanks pose a problem. How big a problem? One Environmental Protection Agency (EPA) estimate says that 11 million gallons of gasoline alone seep into the ground annually. That's the equivalent of the Exxon Valdez oil spill happening every year without our even seeing it!

Because the spills occur underground, it's easier for the pollution to reach sources of drinking water. And it only takes a single gallon of gasoline to make 1 million gallons of water undrinkable.

Fortunately, technology has provided some solutions for the problem. One approach is to use double-walled tanks with special monitoring systems between the walls. If the first wall springs a leak, an alarm goes off. Then, the second wall traps the leak until help arrives. Tank makers are also using fiberglass and other nonmetal materials to eliminate rust and corrosion that could cause leaks.

Replacing old tanks with the new tanks is expensive. But it is one sure way to clean up a continuing source of oil spills.

*From Current Health 2, October 1992*

## **Article #2**

### **Danger Below the Sands**

Over several decades, millions of gallons of aviation fuel, solvents, and other toxic chemicals were dumped or spilled on the grounds around Otis Air Force Base on Massachusetts' Cape Cod. Leaky underground storage tanks, sewage systems, and other sources of contamination throughout the Cape also released hazardous chemicals into the ground.

These chemicals have now seeped underground into the aquifer, from which cities, towns, and individuals on the Cape draw their water. Cape Cod rests on hundreds of feet of sand left after the last Ice Age. Far below the surface, this sand holds rainwater that has seeped down through the sand. Once in the aquifer, the water travels toward the sea, following underground contours in the aquifer.

Unfortunately for the people of Cape Cod, the underground pollution has reached the aquifer and is on its way to the ocean. This means that municipal and private wells throughout the island are becoming contaminated. What's more, the underground pollution is traveling outward toward the sea in plumes. These plumes are found at different depths, depending on the kind of pollutant. Solvents are heavy and sink deeper in the aquifer before they spread outward. Organic pollutants may stay at shallower levels. So simply changing the depth of wells will not solve the problem.

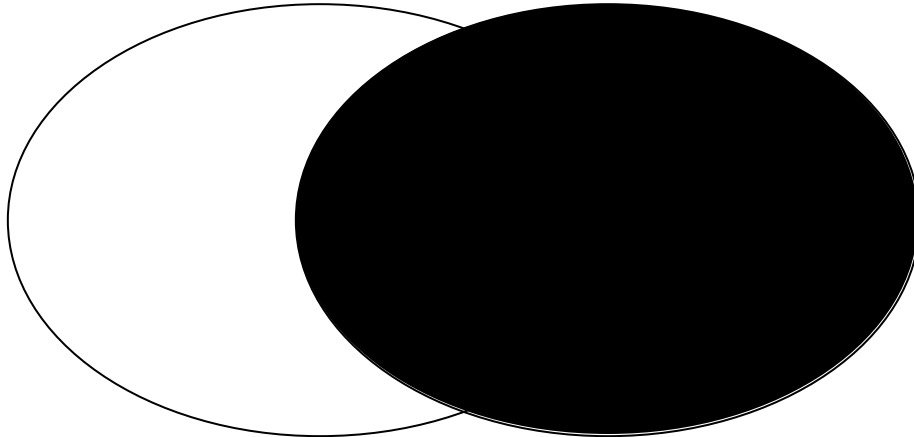
Scientists estimate that it may take 100 years for the toxic materials to work their way through the Cape Cod aquifer.

*From Current Health 2, March 1993*

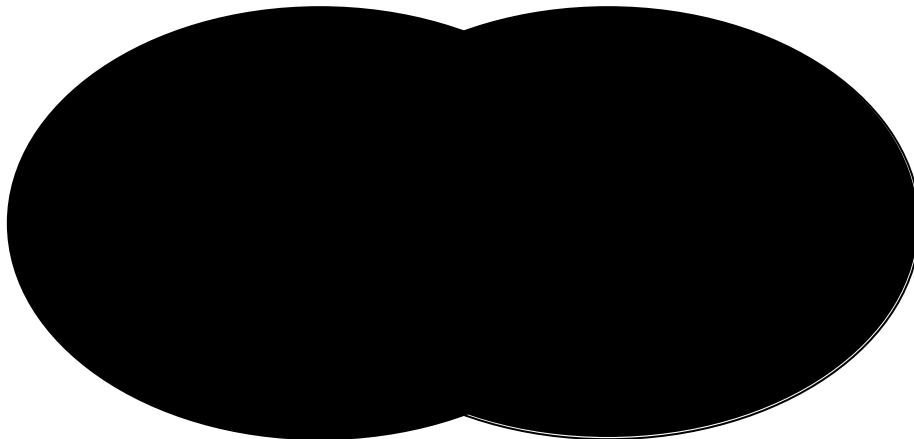
**Tanks A Lot - Article #1**

**Cape Cod Article - #2**

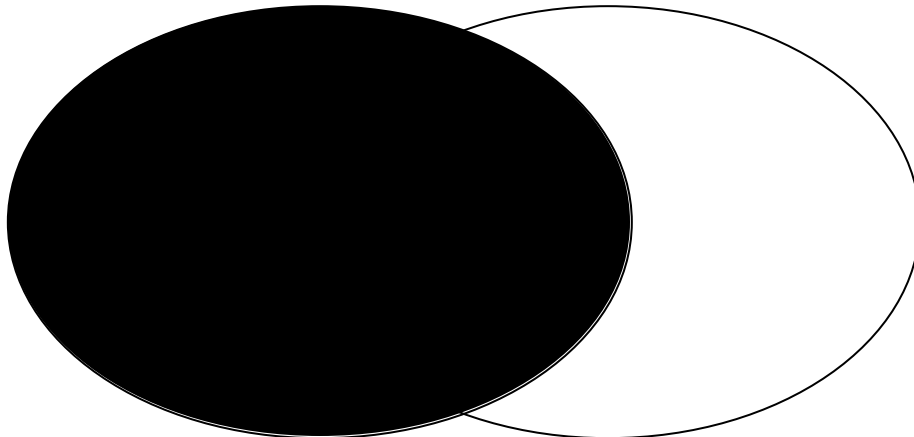
CAUSE



EFFECT



SOLUTION



PREVENTION?

