

# UEnvironmental PDATE

KELLY AIR FORCE BASE, TEXAS

## What's Inside

- Army of bugs attacks contamination.
- InfoPage: What is groundwater?
- Kid Stuff: Recycling helps the environment.

## Interim Actions

### Getting ahead of the problem

January 1998

**I**f you've ever driven through a pothole, you already understand the importance of interim actions.

Potholes are an easily remedied problem—simply fill them in. While not a permanent fix, this interim action keeps the hole from getting larger, prevents damage to cars and makes drivers happier. Imagine how bad potholes would be if instead of fixing them, road crews just left them until the street was scheduled for resurfacing. Eventually the problem would get out of hand and the street would be reduced to a pile of rubble.

Environmental engineers also use interim actions when cleaning up a contaminated site. But instead of filling potholes, they install things like groundwater extraction wells and collection trenches. These short-term measures keep the problem from getting worse while the final cleanup plan goes through its lengthy approval process.

### A head start

According to environmental laws, before a treatment system can be installed at a site, the site must go through a lengthy investigation process. Once the investigation is finished, a cleanup plan is chosen, which then must go through a long review and approval process. The investigation and approval process can take several years.

Interim Actions are allowed so the Air Force can put a cleanup system in place while the investigation and selection of a final plan is going on. Using Interim Actions, engineers can keep the problem from getting worse. The result is reduced risk to people around the base.

Kelly AFB has installed 17 interim cleanup

systems at sites all over the base. Their primary purpose is to slow down or stop the movement of contamination from the base to off-base neighborhoods. Interim actions have also been used to quickly take care of sources of contamination on base. Removing or cutting off the source the contamination not only prevents the problem from getting worse, but it also makes it easier to clean up in the future—essentially giving engineers a head start.

### Interim Actions at Kelly

Most of Kelly's interim actions are designed to isolate the source and slow the spread of contamination. At Zone 1, for example, extraction wells are being used at three sites to prevent contaminants from nearby landfills from getting into Leon Creek.

Similar measures are being used at seven sites in Zones 2, 3 and 5 to slow the flow of contaminated groundwater off-base.

Interim actions are also in place to remove sources of contamination. At Zones 2 and 5, bioventing has been successful at two sites and is being used at three other sites (including a site in Zone 3) to clean up contaminated soil. In the 1100 Area, an old fuel spill is being cleaned up using soil vapor extraction and by extracting and treating the groundwater.

Treatability studies are another way the Air Force can get a head start cleaning up a site. Treatability studies test how well a cleanup technology will work at a specific site. If it works well, it may be used in the final cleanup solution. When the final treatment system is installed, there is less to clean up. That means it gets cleaned up faster.

*Si le gustaría una traducción del texto en Español, por favor llame a Ron Scharven, al teléfono 925-3100, ext. 226.*

# AF enlists 'bugs' to clean up soil

**C**leaning up hazardous waste is almost never easy. Not only that, it usually takes a long time and it's expensive.

An exception to this rule is a cleanup process called bioventing. Bioventing is a combination of two technologies—*bioremediation* and *soil venting*. Bioremediation means to clean up using natural processes. Soil venting is a technology used to put air into the soil.

Scientists discovered that some types of microscopic bacteria that live in the soil have an appetite for chemicals found in petroleum products, like gasoline, diesel fuel and jet fuel. However, these bacteria, or "bugs," eat too slowly to be of much practical use for cleaning up fuel spills.

The bacteria "eat" the fuel by breaking it down into simpler chemical compounds using a series of chemical reactions. All chemical reactions need certain elements to be present or they won't work. Simply put, the bugs need oxygen or they can't start the chemical reactions that break down the fuel. While there is some oxygen trapped in the soil, there isn't much. Scientists learned that the bugs would eat the fuel as long as there was enough oxygen. When the oxygen ran out, the bugs quit eating.

The solution—give the bugs air using soil venting.

The first tests were done above-ground by injecting air into piles of contaminated soil. After a few weeks, tests showed the bugs were

eating the fuel. Bioventing worked!

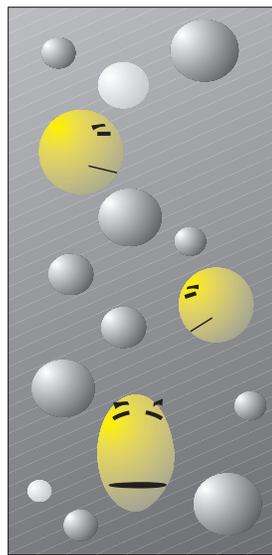
Today, bioventing is used all over the world both in the military and private industry and is the preferred method of cleaning up petroleum contamination. Why? Because it's inexpensive, it works relatively quickly, and it's easy to implement. But perhaps the best part about bioventing is that the bacteria completely destroy the contaminants.

Instead of removing contaminants from the ground and hauling them away for treatment and disposal like most cleanup technologies, bioventing destroys the chemicals without treatment. There is also no hazardous waste to haul away. The main by-products of the bacteria's chemical reactions are carbon dioxide and water.

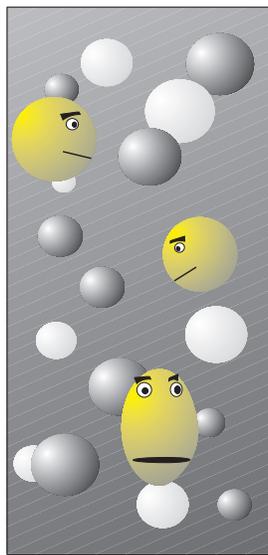
Kelly has used bioventing since 1994 at three sites. Plans are in the works to use it at several other sites.

Bioventing is not the cure-all for cleaning up contaminated soil. In fact, there are many things the bugs won't eat. For example, bioventing will not clean up most solvents. Bioventing also does not work well in certain types of soils.

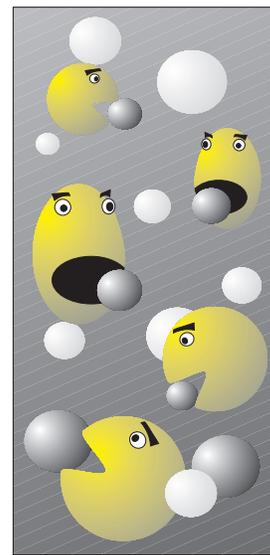
Air Force scientists continue looking for new and better ways to clean up contamination in the soil and groundwater. With successes like bioventing, science now looks to nature as an important partner.



Before cleanup begins, there's not a lot of oxygen in the soil. The bugs are there, but not very active.



By adding oxygen to the soil, the bugs are able to break down the fuel molecules.



The bugs use the oxygen to create chemical reactions, which break the fuel down into harmless things like carbon dioxide and water.

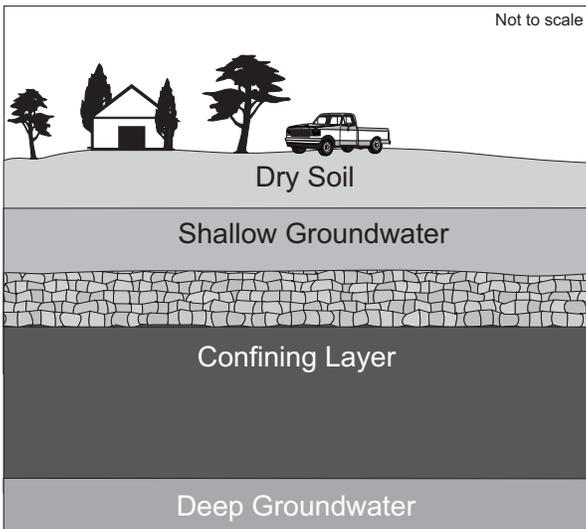


# What is GROUNDWATER?

## Groundwater

Groundwater is found underground in geologic formations called aquifers. Groundwater is commonly used as a source of drinking water as well as irrigation.

Groundwater is usually found in layers. The layer closest to the surface is called shallow groundwater. Other layers are called deep groundwater.



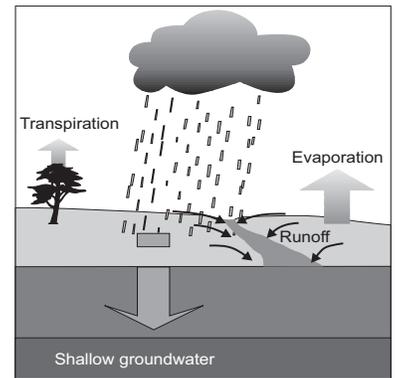
### What's groundwater like?

An easy way to imagine the shallow aquifer is to think of water in a sponge. Soil is like a sponge that holds water in it. Like a sponge, soil has billions and billions of tiny spaces between the soil particles. When the soil is dry, air fills the spaces. But add water to it, and the water fills the spaces instead of the air.

The Edwards Aquifer is different than shallow aquifers. Water fills in very large spaces in the limestone—much like underground caves full of water.

### Where does groundwater come from?

When rain hits the ground, it can go any (or all) of four places. It can evaporate into the air, it can flow along the surface and collect in rivers or lakes, it can soak into the ground or it can be absorbed by plants.

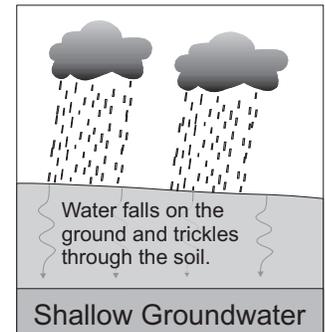


When water dries up, it becomes water vapor. Water in lakes, streams, rivers, and even puddles, is called surface water. Water that soaks into the ground becomes groundwater.

Trees, grass and other plants also draw water from the soil. They use what they need and transpire the remaining water through their leaves and stems.

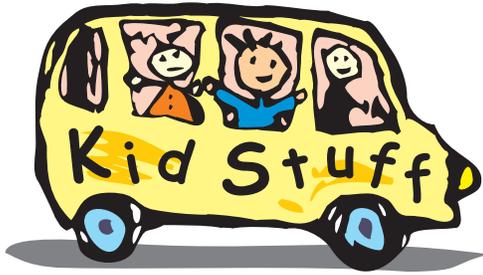
### Shallow vs. Deep Groundwater

Being closest to the surface, shallow groundwater is most easily contaminated by surface contamination. Rain water that soaks into the ground can carry contamination on the surface deeper into the ground until it reaches the shallow groundwater.



Deep groundwater is protected from the surface by layers of rock and clay. The Edwards Aquifer, a deep aquifer, is separated from the surface by several hundred feet of clay, limestone and shale. These layers of rock and clay effectively protect the deeper Edwards Aquifer from the shallow groundwater.

The Edwards Aquifer is San Antonio's primary source of drinking water, and the source of your drinking water if you use city water.



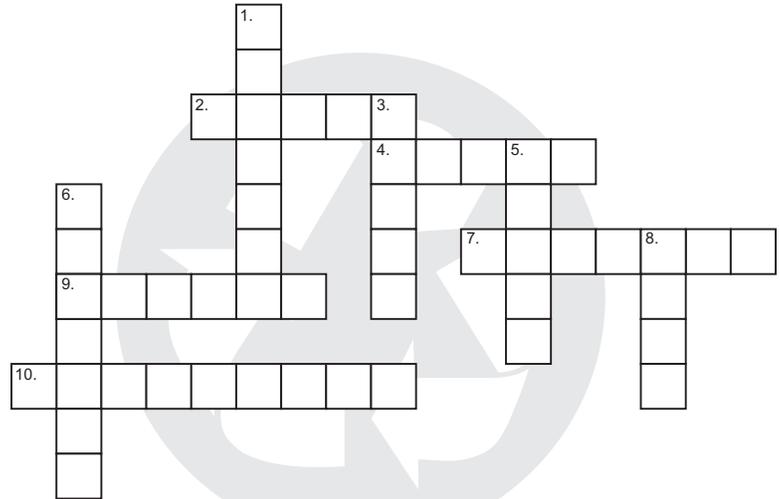
## Why recycle?

Did you know that nearly 500,000 tons of garbage is buried in American landfills every day? That's a lot of trash!

Did you also know that much of what's thrown away can be recycled and used again? Recycling helps the environment in a couple of ways. First, it reduces the amount of landfill space needed to bury the trash. Second, it allows things to be remade using existing materials.

For example, things like paper, plastic, aluminum and glass can be easily recycled and made into things we use. By recycling paper, we can make many new paper products without having to cut down as many trees.

Last year Kelly AFB recycled 1,194.8 tons of paper and cardboard and 3.9 tons of aluminum. We encourage you to recycle, too.



### Clues

1. Milk jugs are made of \_\_\_\_\_.
2. It can be found in sheets, rolls and reams.
3. Use something again.
4. Third rock from the sun.
5. Recycling paper and cardboard saves \_\_\_\_\_.
6. Waste that can't be recycled.
7. Don't throw it away, \_\_\_\_\_ it!
8. Aluminum soda pop containers.
9. You can \_\_\_\_\_ the amount of waste you make by conserving and recycling.
10. Places where trash is buried.

## Staying In Touch

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## Upcoming Events

January 28, 1998

Restoration Advisory Board Meeting

6 p.m.

Dwight Middle School