THE AMERICAN WELL OWNER

★ INFORMATION AND ADVICE ABOUT GROUND WATER, WELLS AND WATER SYSTEMS ★

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Independent Authority on Ground Water

Septic System Additives

MESSAGE FROM THE PUBLISHER

Policing Polluters
Who is Protecting Private Wells?

Dennis King, a University of Maryland economist, suggests that the way many businesses and individuals decide how they'll behave, including behavior that may harm the environment, is based on:
1. Will I be caught? 2. Will I be charged? 3. Will I be convicted? 4. Will significant penalties be imposed, and are they likely to stick? "It's normal human behavior", King says, "something we all do every day, from calculating taxes to exceeding the speed limit to building houses on environmentally sensitive lands. We calculate the benefits of pursuing self-interest against the costs of getting 'dinged' by the authorities."

How can private well owners ensure that some other person's perceived self-interest [laziness or ignorance] does not threaten their well, for example by over-use of fertilizers, non-maintenance of septic systems, dumping of hazardous waste, keeping too many animals etc. Who polices rural and suburban areas to ensure that aquifers used by private wells are protected? On-site supply wells fall beneath the radar of most regulatory agencies. How does a well owner ensure that a well is protected? What options are there for well owners to 'ding' a person whose actions, or negligence, may threaten aquifer integrity?

Step one; find out where responsibility lies at the town, county and state level for reporting actions that may threaten wells. Step two, make sure your local planning boards, conservation commissions, and building inspectors understand the economic value of safe ground water. [Get them to subscribe to THE AMERICAN WELL OWNER). Step three; help promote ground water awareness and "cause & effect" water education in your community by encouraging local schools to emphasize environmental education. [Send a teacher to one of the Trust's Ground Water Institutes for Teachers™ training programs.] Step four, talk to your neighbors about the self-interest of protecting wells. Water supply sustainability is priceless.

Andrew W. Stone
American Ground Water Trust

There are 20 million septic systems in operation in the US. There are over 1,200 products on the market across the United States that claim to improve the performance of onsite wastewater disposal (septic) systems. The products are offered as "solutions" to apparent problems of drainfield clogs, soil percolation inefficiency, and odors. However, most scientifically reviewed information shows that septic system additives are not needed to maintain a properly functioning septic system.

Onsite wastewater disposal systems are intended to treat the sanitary wastes from a home. Conventional septic tanks are designed to separate solids, fats, and greases from the effluent (liquid) entering the drainfield (leach field) of the system through anaerobic digestion and gravity settling. Anaerobic bacteria within the tank decompose the organic (carbon) solids into liquid and gas. Those solids that do not breakdown settle to the bottom of the tank as sludge or rise to the surface to form a scum layer resulting in a "clear liquid" zone between these two layers. The clear liquid is released to the drainfield through a baffled-siphon pipe. If the system is maintained properly it usually will provide many years of trouble free service.

The three main categories of additives on the market are inorganic chemicals, organic chemical solvents and biological treatments. They are marketed to reduce or remove greases from wastewater in the septic system but may end up contaminating ground water. Inorganic chemical additives include acid or base (caustic) compounds. Organic chemical solvents such as trichloroethylene (TCE), and methylene chloride (dichloromethane) are chlorinated compounds intended to remove food fats and grease and prevent general septic system clogs. Acids, bases, and solvents are hazardous materials. They can kill the bacteria in the tank, which slows the normal decomposition and the settling process within the tank. In many cases the solvents will act to re-

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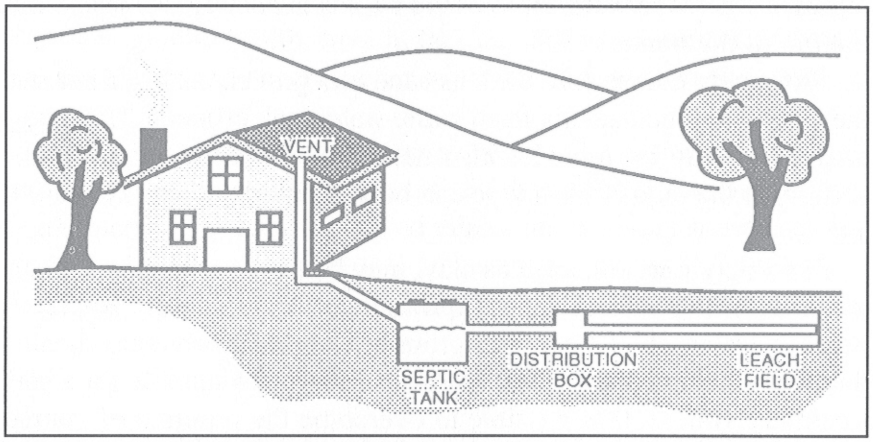
Septic System Additives . . . *continued from page 1*

suspend or inhibit settling of the sludge material. These additives do not breakdown into harmless compounds within the system and will eventually reach and contaminate the underlying ground water.



Cross-section view of typical home septic system

Biological additives are marketed as a method to "start" bacterial activity in a new septic system or to enhance the activity in "stressed" or recently pumped systems. New or recently pumped systems are self-starting with the natural bacterial content of the domestic organic waste entering the system and do not require a jump-start.

Systems stressed with excess bleach or home cleaners can recover without any additives. A study at the University of Arkansas found that a 1,000-gallon septic tank quickly returned to normal function after receiving (in a single "killing" dose) over 2 gallons of laundry bleach, 5 gallons of Lysol or 1.5 ounces of Drano. These dose levels are much higher than would ever be expected from a family household, so it is not apparent that any additives are necessary or help to rehabilitate a system. Most state environmental agencies do not recommend the use of additives to maintain onsite wastewater disposal systems and several states prohibit the use of certain products.

Be aware of the terms used to market an additive. Many will show "approved" on the label, but this simply means that the product does not pose a human health risk (if used appropriately) and has nothing to do with the effectiveness of the product. If in doubt one can contact the "approving" agency for a clarification or ask the manufacturer for the approval notice.

Using commercially available household cleaners such as laundry bleach, detergents, drain cleaners according to the manufacturers directions will not adversely affect the operation of a residential septic system. Remember, "less is usually better." Contact your local health official before disposing of chemicals related to hobbies, automobile maintenance, or home industries into the system. Well owners have a strong vested interest in the safe operation of their, and their neighbors' septic systems.

For more septic system information visit:
http://www.agwt.org/SepticSystems. (American Ground Water Trust)
http://www.nesc.wvu.edu/nsfc/nsfc_septicnews.htm (National Small Flows Clearinghouse)
http://septic.coafes.umn.edu/Homeowner/NewsReleases/SystemO&M.html (University of Minnesota Extension Service)

Aquifer Porosity and Permeability . . . *continued from page 4*

elevation (lower potential). As opposed to surface water flow, ground water has to work its way through small spaces and fractures in rocks, which is why rates of ground water movement are very slow. Underground lakes, rivers and streams only exist in specific and relatively rare circumstances where the secondary permeability of limestone rocks may have been enlarged by solution.

High porosity does not necessarily lead to high permeability. The voids within a rock must be interconnected to form pathways for the water to travel. The pathways must be wide/ large enough to allow the water to overcome the attractive forces ("surface tension") that results from the polar quality of the water molecule structure. The porosity of clay may be high, but because it has low permeability the water can't be easily removed.

When constructing a water well, the driller is trying to intersect the rock type or aquifer zone that has the greatest porosity (can store water) and permeability (will let water flow). Many bedrock wells intersect permeable fractures that are themselves in contact with less permeable zones where water is stored. If flow to a well is limited because of low permeability, it can still be a viable supply source. A well yield of half a gallon a minute will produce 720 gallons a day. Most families use less than 400 gallons a day.

Chemicals in the Home - Storage and Handling

"Household" may convey the impression of "safe" with regard to chemical products. However, "safe" supposes that the products are always used and stored exactly according to the manufacturer's directions. Many "safe" products, and many commonly used fuels and chemicals, are in fact extremely toxic and could be a real risk to ground water quality. The designation of "safe" for household products may be based on the relatively small concentration of the chemical in the product and/ or the total quantity of the product in the retail-size container, and not on the actual potential threat to human health.

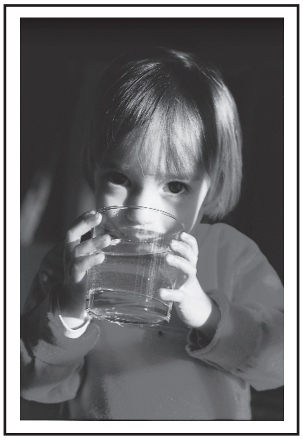
Many household products contain chemicals that are regulated by the US Environmental Protection Agency (EPA) because of the risks they pose to human health or safety. Many regulated chemicals and substances are further classified as "hazardous" or "toxic" by the Occupational Safety and Health Administration (OSHA) because of the risks associated with physical safety (e.g., explosive) or acute health threats. It is important to read the use and handling labels on household chemical products to learn the limitations and conditions that can lead to unsafe situations. If mishandled, spilled, not stored properly or not disposed of properly, household chemicals can be dangerous and can contaminate ground water.

Listed below are examples of common products that may contain hazardous chemicals.
Automotive (anti-freeze, brake fluid, gasoline, oil, windshield washer fluid, transmission fluid)
Barbecue (propane, charcoal briquettes, lighter fluid)
Health and beauty (nail polish, nail polish remover, hair coloring products, hair remover, hairspray, medications)
Home maintenance (paint, varnish, stains, oils)
Household cleaners (ammonia, bleach, air freshener, carpet freshener, disinfectants, furniture polish, window cleaner).
Laundry (laundry detergent, fabric softener, bleach)
Lawn and garden (fertilizer, pesticides, herbicides, mouse/rat poison etc.) + (gasoline & oil used for mowers etc.)

Where ground water safety is involved, the "small quantities" of regulated chemicals in household products can quickly become "large" if spilled. If gasoline is spilled on the ground while filling a gasoline power tool (chain saw, lawn mower, roto-tiller etc.) the risk of contaminating the ground water is high. For example, a gallon of gasoline contains between 0.5 to 2.5 percent benzene and if spilled, has the potential to contaminate between 1,000,000 to 5,000,000 gallons of ground water to the EPA's Maximum Contaminant Level (MCL) for drinking water of 5 parts per billion for benzene. This could affect the ground water in a radius of several hundred to over 1,000 feet around a typical water well.

Small spills can add up. A one-gallon spill is the same as spilling half a pint (one cup) of fuel once a week during a 4-month long summer lawn-mowing season. When dispensing fuel or preparing chemicals for use, always do so far away from water wells and on an impermeable surface such as a concrete floor or plastic sheeting to catch spills before they can soak into the ground. Spills should be cleaned up and disposed of according to manufacturer's directions. The collected waste should be recycled or disposed of properly at an approved lined landfill or transfer station. Many municipalities or townships have annual Household Hazardous Waste Collection events for citizens to dispose of excess, used or waste hazardous materials. These materials should never be dumped onto the ground, into a septic system, dry well or into a storm drain.

When storing household chemicals always consider the worst-case consequences of a spill or leak. Work out where a spill might travel and avoid locations close to floor drains or porous surfaces. Avoid storing a large quantity of chemicals by purchasing only what is needed for a project or the amount that can be used in a reasonably short period of time (e.g., one spring or summer yard work season). Keep the products in their original containers along with the manufacturer's use instructions. Never ever store chemicals in a well house or anywhere near the wellhead. That cute little wooden water well or the fake plastic rock you have erected over your well casing, is absolutely NOT a place to keep any chemicals or fluids.



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AMERICAN GROUND WATER TRUST

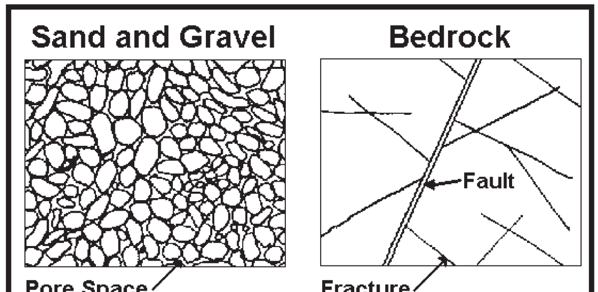
16 Centre Street, Concord, New Hampshire 03301

TOPICS IN UPCOMING ISSUES

- **Top Ten States for Ground Water**
- **Viruses verses Bacteria - What are the Differences?**
- **Mineral Spring Water**

AQUIFER POROSITY AND PERMEABILITY

Ground water occurs beneath the surface of the earth and fills the spaces between rock particles, the pore spaces in consolidated rocks, and occupies fractures and fissures within solid bedrock. Spaces between sediment particles and in solid rock are called voids or pores. The pore spaces occur in various shapes and sizes, some too small to be seen by the naked eye. Each sediment and rock type has different pore characteristics, creating differences in porosity (the ratio of pore space to solid material per unit volume). Porosity is usually stated as a percentage. For example, saturated sand may have 20% pore space to 80% solid material, while fractured granite may have less than 1% pore space to 99% solid rock. The sand is therefore more porous than the fractured granite.



Courtesy of the Wisconsin Water Well Association

In determining how much water will flow to a well, permeability is often more important than the porosity of geological formations. **Permeability** describes how easily water passes through a rock. For example, gravels are porous and permeable, while clays are porous but impermeable. Fractured rock may not have great porosity, but fractures and fissures may make the rock permeable. Permeability is also known as hydraulic conductivity.

Secondary permeability is of great importance in consolidated rocks and usually occurs as fractures, cracks, and fissures which have been caused by movements of the earth's crust. An aquifer may have both primary porosity and secondary porosity. Primary porosity of the rock is created as the geologic deposit (rock type) is formed. **Secondary porosity** develops after the formation of the rock, perhaps due to fracturing or the dissolution of mineral grains. For example, if some of the grains in a glacial deposit are limestone (calcium carbonate), these grains may be dissolved by an acidic ground water and the porosity of the deposit will increase as the grains "disappear" to form a new or larger void.

Ground water will flow under the influence of gravity from a high elevation (high potential) to a lower

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