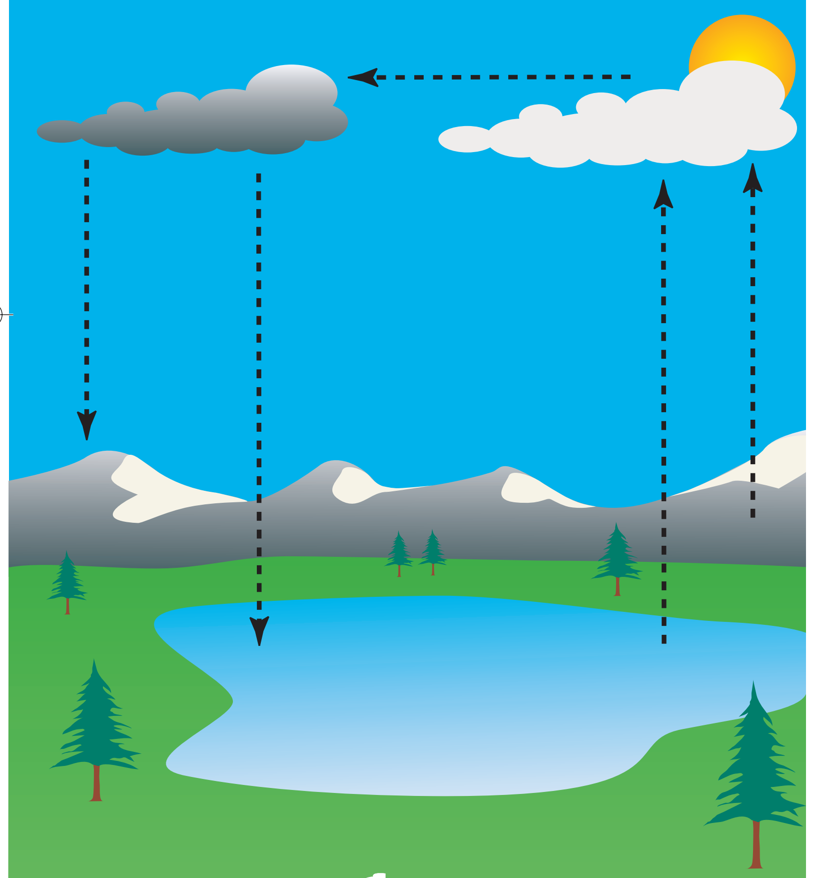
Groundwater Protection



New Nouveau Brunswick CANADA

Health and Wellness

What is Groundwater?

Groundwater is but one stage, or form, through which water passes in the Earth's hydrologic cycle (see Figure 1). The hydrologic cycle is the continual movement of water over, in, and through the Earth as it changes from one form -- solid, liquid, gas -- to another.

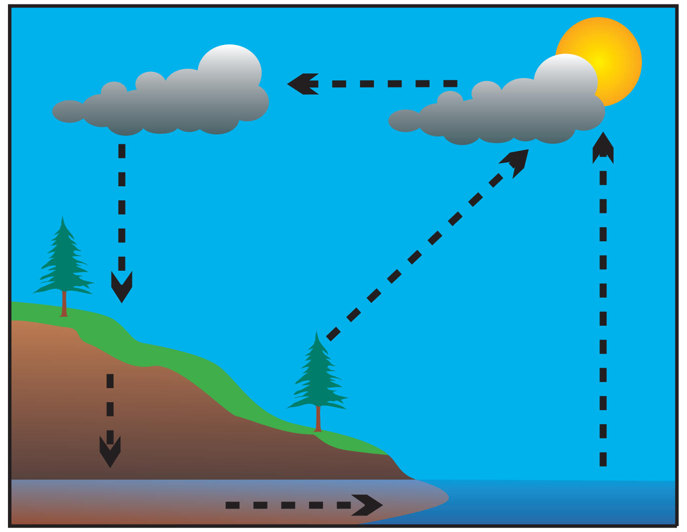


Figure 1. The hydrological cycle

The water you use today may have evaporated from an ocean, travelled through the atmosphere, fallen back to the Earth's surface, gone underground, and from there moved to streams leading back to the seas. Water is readily visible in many forms -- clouds, rain, snow, fog, lakes, streams, oceans, polar ice caps -- but as groundwater it is, by definition, out of sight. Our understanding of groundwater and its role in the hydrologic cycle has been hindered by the difficulty of observing and measuring the properties and extent of groundwater.

Long-standing misconceptions about groundwater's origin, occurrence and movement have by no means prevented people from using it. Groundwater supplies have been tapped for thousands of years, but only recently have we started to understand its characteristics and manage it. Much remains to be discovered about groundwater, but wider public awareness of its nature and properties is an important first step.

CNB - 2258/10/03

Water Underground

When water falls to earth as rain or snow, most of it seeps into the ground. It first passes through the unsaturated zone, where soil pores are filled partly with air and partly with water. Plant roots, bacteria, fungi, insects, and burrowing animals are found in the unsaturated zone. The water flows downward through the unsaturated zone into the saturated zone, where all pores are filled with water. The upper boundary of the saturated zone is called the water table (see Figure 2). The water table rises when water enters the saturated zone; the water table falls when water is pumped from the saturated zone. Water in the saturated zone is commonly referred to as groundwater.

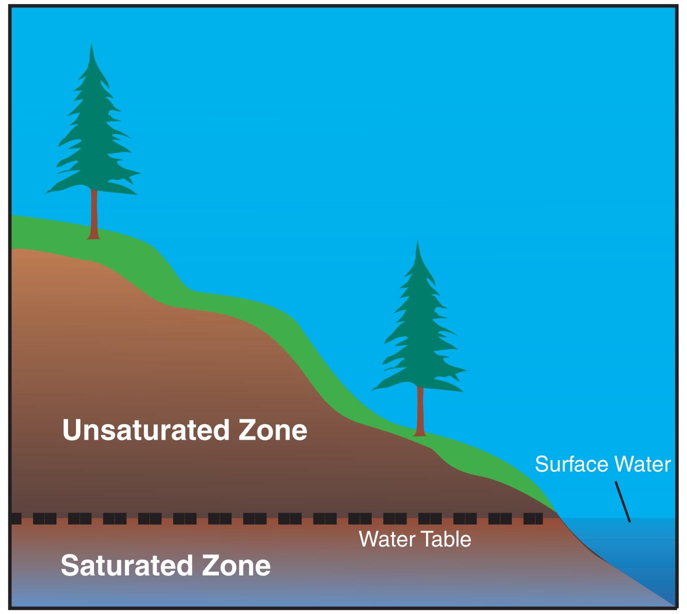


Figure 2. Underground water zones

Recharge

The process by which water -- from rainfall, snowmelt, and other sources -- flows into a water-bearing geologic formation is known as recharge. Recharge of the saturated zone occurs as water seeps down through the unsaturated zone. The unsaturated zone is important to the groundwater underlying it because incoming water seeps down through the unsaturated zone into the saturated zone. Both the quantity and quality of groundwater can be affected by the condition of the unsaturated zone in a recharge area.

Septic Systems

Septic systems are the largest of all contributors of wastewater to the ground and are the most frequently reported sources of groundwater contamination (see Figure 3). Wastewater from septic systems may include many types of contaminants such as nitrate, harmful bacteria and viruses. Chemical substances commonly used by homeowners such as pesticides, paints, varnishes, and thinners can also end up in the groundwater. Chemical contamination is especially dangerous since it may be permanent. Some chemicals, even in small amounts, are almost impossible to remove from the groundwater once they reach the saturated zone.

Evidence indicates that bacteria and viruses are removed in the unsaturated zone and do not live for extended periods in the saturated zone. However, in fractured rock where groundwater flow rates can be high, these bacteria and viruses may be transported very rapidly and could contaminate nearby drinking water supplies. These microorganisms can live below the water table for several months, and some can create health problems if consumed by people. Therefore it is critical that your well casing is sealed and separated from the absorption field area. This will keep the contaminated water from seeping into and mixing with your drinking water.

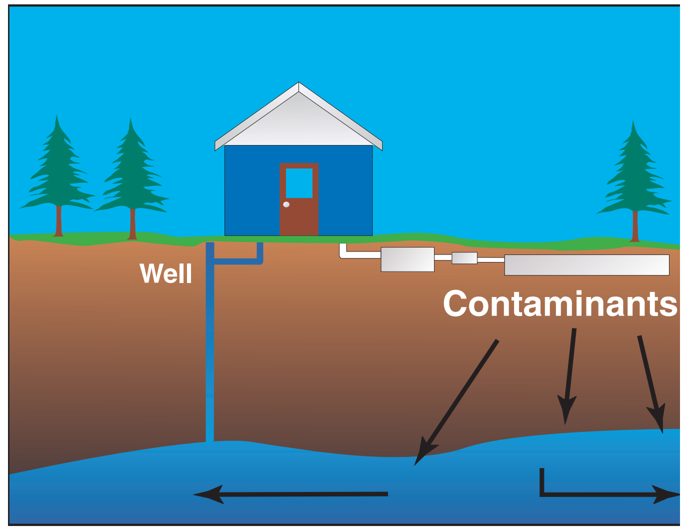


Figure 3. Septic tank drainage

Distances and Dimensions

A septic system must be located away from wells, streams and houses. Figure 4 shows an example of a typical layout of an on-site wastewater disposal system. In addition to spacing, minimum dimensions have been established for disposal fields and pipelines. Depth of absorption field trenches and distance between trenches are specified in New Brunswick regulation 88-200 (On-Site Sewage Disposal Systems).

Water use in rural houses can be predicted from the house plan, depending on the number of bedrooms and bathrooms, water-using appliances, and potential additions.

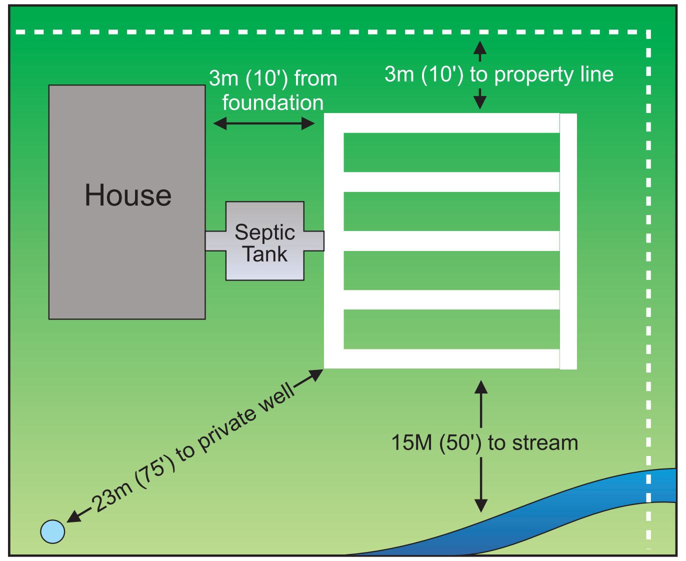


Figure 4. Typical layout of a septic system (trench system)

Although the actual number of residents determines water use in a house, the house plan suggests the potential number of residents and wastewater flow which varies from a minimum of 1,364 litres (300 gallons) per day to 4,546 litres (1,000 gallons) or more. This flow estimate, plus the soil permeability estimate, is used to determine the disposal field area needed for your house. Installing a sufficient drainfield will help your septic system function longer.

For further information please contact your local Public Health Inspection office.

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