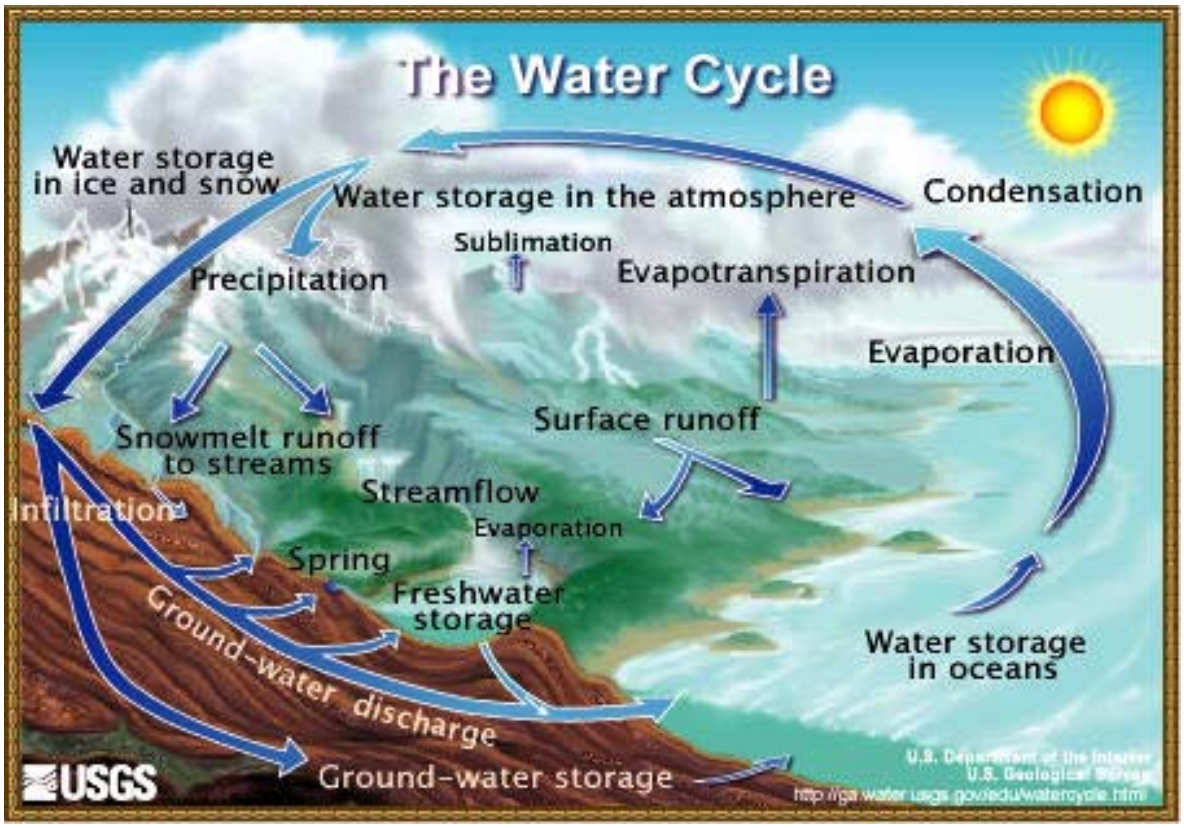
Basic Groundwater Flow

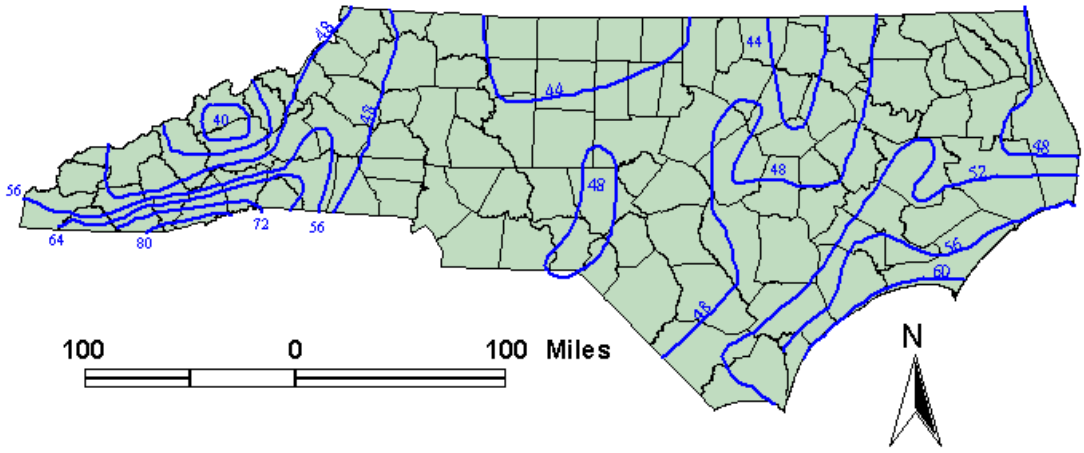
Water occurs and moves within the "Hydrologic Cycle." Water evaporates and then forms clouds though a process called condensation. Precipitation returns this water to the ground surface in the form of rain, snow, sleet, etc. After falling back to the Earth's surface, liquid water continues within the Hydrologic Cycle through one or more of these pathways:

1. ***Direct evaporation back into the atmosphere*** – this water again forms clouds and is eventually precipitated again back to the Earth's surface.
2. ***Run off flow into surface water bodies***. This water flows on the land surface into ponds, lakes, streams, or oceans. Water from these bodies may again be evaporated back into the atmosphere, or in the case of streams, may continue flowing toward the ocean.
3. ***Soaking into the ground***. This water may be taken up by vegetation and then returned to the atmosphere as water vapor through plant transpiration. However, water not used by plants seeps deeper into the ground and saturates rock and soil, and is called ***groundwater***. In North Carolina, groundwater typically flows into surface water bodies, where this water may again be evaporated into the atmosphere.



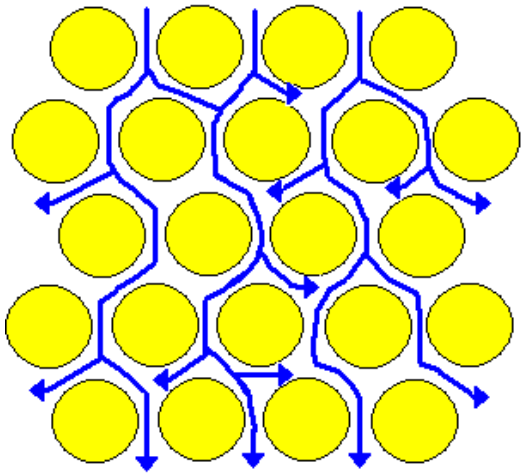
(Image courtesy of the U.S. Geological Survey)

Precipitation recharges groundwater. Typical precipitation rates across North Carolina are heaviest in the mountains and along the coast.



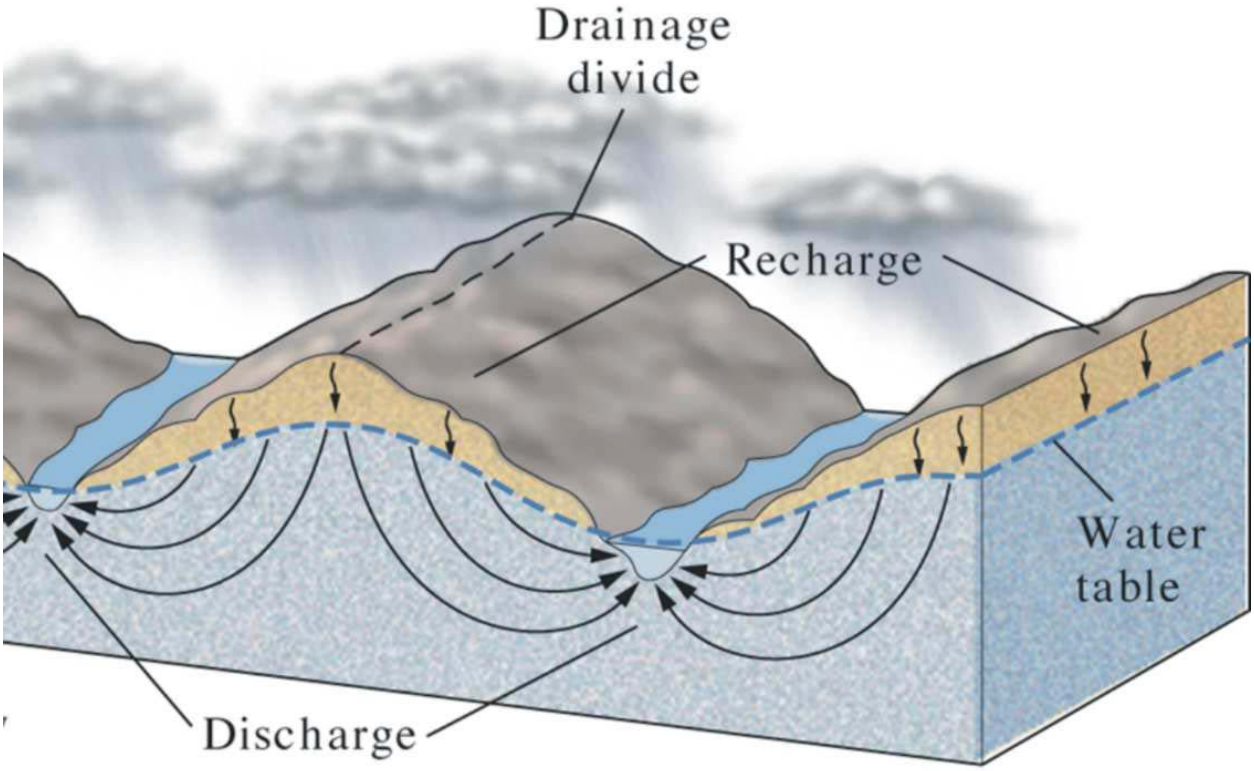
(Image from Hirth and Haven, 2001. Units are in inches.)

In North Carolina, groundwater does not typically occur in vast underground lakes, pools, or rivers. Groundwater actually occurs and flows through empty spaces between soil grains and rock fractures.



The image above represents soil particles (yellow circles) and flowing groundwater (blue arrows). It is through this manner that groundwater saturates, is stored in, and flows through soil and fractured rock. The top of the saturated soil and/or rock is called the ***water table***. The water table may be most easily seen by digging a hole in your yard or at the beach. If you continue digging, you will eventually find standing water in your hole. The surface of this standing water is the water table.

Contrary to popular belief, the water table is not a consistent, flat surface. Actually, the water table typically mimics the over lying land topography. Notice also how the water table not only marks the top of the saturated sand, soil and rock (blue colored zone), but it also marks the surface of the streams.



(Image courtesy of Eudy, 2007)

In this diagram, "recharge" events occur as rainfall, which allows water to soak into the ground. This saturates much of the underlying soil and rock. Notice how groundwater flows from higher elevations, beneath the hill tops, toward the lower elevations, and discharges into streams. Additionally, groundwater on the right side of the drainage divide (hilltop) does not naturally flow to the left side of the drainage divide, and vice versa.