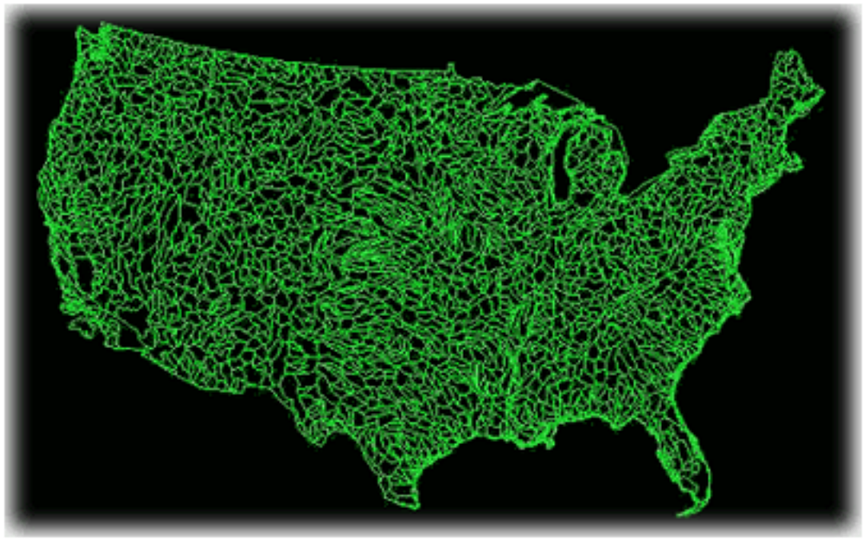
What is a watershed?

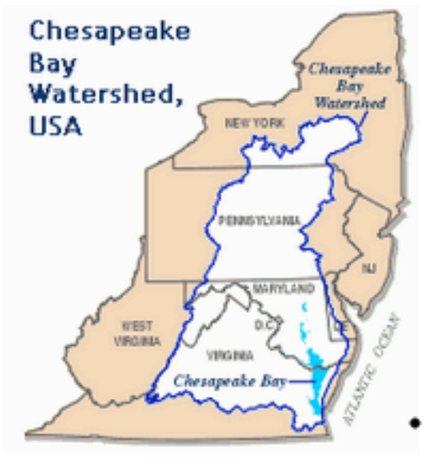


When looking at the location of rivers and the amount of streamflow in rivers, the key concept is the river's "watershed". What is a watershed? Easy, if you are standing on ground right now, just look down. You're standing, and everyone is standing, in a watershed. A watershed is the area of land where all of the water that falls in it and drains off of it goes into the same place. Watersheds can be as small as a footprint or large enough to encompass all the land that drains water into rivers that drain into Chesapeake Bay, where it enters the Atlantic Ocean. This map shows one set of watersheds in the continental United States; these are known as National 8-digit hydrologic units (watersheds).

A watershed is an area of land that drains all the streams and rainfall to a common outlet such as the outflow of a reservoir, mouth of a bay, or any point along a stream channel. The word watershed is sometimes used interchangeably with drainage basin or catchment. Ridges and hills that separate two watersheds are called the drainage divide. The watershed consists of surface water--lakes, streams, reservoirs, and wetlands--and all the underlying ground water. Larger watersheds contain many smaller watersheds. It all depends on the outflow point; all of the land that drains water to the outflow point is the watershed for that outflow location. Watersheds are important because the streamflow and the water quality of a river are affected by things, human-induced or not, happening in the land area "above" the river-outflow point

Footprint on the Moon - if it did rain on the Moon, then this footprint would be a watershed. (Credit: NASA)

A watershed is a precipitation collector



Most of the precipitation that falls within the drainage area of a stream's monitoring site collects in the stream and eventually flows by the monitoring site. Many factors, some listed below, determine how much of the streamflow will flow by the monitoring site. Imagine that the whole basin is covered with a big (and strong) plastic sheet. Then if it rained one inch, all of that rain would fall on the plastic, run downslope into gulleys and small creeks and then drain into main stream. Ignoring evaporation and any other losses, and using a 1-square mile example watershed, then all of the approximately 17,378,560 gallons of water that fell (you can use our interactive rainfall calculator to find out how many gallons of water fall during a storm) as rainfall would eventually flow by the watershed-outflow point.

Not all precipitation that falls in a watershed flows out

To picture a watershed as a plastic-covered area of land that collects precipitation is overly simplistic and not at all like a real-world watershed. A career could be built on trying to model a watershed water budget (correlating water coming into a watershed to water leaving a watershed). There are many factors that determine how much water flows in a stream (these factors are universal in nature and not particular to a single stream):

- **Precipitation:** The greatest factor controlling streamflow, by far, is the amount of precipitiation that falls in the watershed as rain or snow. However, not all precipitation that falls in a watershed flows out, and a stream will often continue to flow where there is no direct runoff from recent precipitation.
- **Infiltration:** When rain falls on dry ground, some of the water soaks in, or infiltrates the soil. Some water that infiltrates will remain in the shallow soil layer, where it will gradually move downhill, through the soil, and eventually enters the stream by seepage into the stream bank. Some of the water may infiltrate much deeper, recharging ground-water aquifers. Water may travel long distances or remain in storage for long periods before returning to the surface. The amount of water that will soak in over time depends on several characteristics of the watershed:
  - **Soil characteristics:** In Georgia, clayey and rockey soils of the northern areas absorb less water at a slower rate than sandy soils, such as in Georgia's Coastal Plain. Soils absorbing less water results in more runoff overland into streams.
  - **Soil saturation:** Like a wet sponge, soil already saturated from previous rainfall can't absorb much more ... thus more rainfall will become surface runoff.
  - **Land cover:** Some land covers have a great impact on infiltration and rainfall runoff. Impervious surfaces, such as parking lots, roads, and developments, act as a "fast lane" for rainfall - right into storm drains that drain directly into streams. Flooding becomes more prevalent as the area of impervious surfaces increase.
  - **Slope of the land:** Water falling on steeply-sloped land runs off more quickly than water falling on flat land.
- **Evaporation:** Water from rainfall returns to the atmosphere largely through evaporation. The amount of evaporation depends on temperature, solar radiation, wind, atmospheric pressure, and other factors.
- **Transpiration:** The root systems of plants absorb water from the surrounding soil in various amounts. Most of this water moves through the plant and escapes into the atmosphere through the leaves. Transpiration is controlled by the same factors as evaporation, and by the characteristics and density of the vegetation. Vegetation slows runoff and allows water to seep into the ground.
- **Storage:** Reservoirs store water and increase the amount of water that evaporates and infiltrates. The storage and release of water in reservoirs can have a significant effect on the streamflow patterns of the river below the dam.
- **Water use by people:** Uses of a stream might range from a few homeowners and businesses pumping small amounts of water to irrigate their lawns to large amounts of water withdrawals for irrigation, industries, mining, and to supply populations with drinking water.