Seeps and Springs

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The familiar image of a waterway's source is a spring bubbling near a mountain peak and forming rills that cascade into the valleys below. As this description depicts some upland headwaters, much more spring water emerges and feeds into these winding waterways along their course to the ocean. Several types of springs exist based on the local geology, such as hot water springs powered by volcanic activity and fracture springs, where water flows along bedrock cracks. Throughout Northern Virginia, the common way water emerges naturally from the ground is called a seep or spring. Between the surface and some set depth, a soil core sample or profile shows various soil layers. Each of these layers consists of a different geology, such as clay, sand, gravel, loam, humus, and stone sheets. Porosity, or the ratio of gaps to solids a material has, determines the amount of water and air that can enter. Rain water percolates downward into porous soil layers and is absorbed. Once the water encounters a layer that either drastically slows or stops its motion, it accumulates into a water table. Water follows that solid layer, still heading downward but at less of a declining angle. Finally, the water-saturated soil breaks a lower-elevation surface at the seep or spring and continues running above ground as a small stream. Seeps slowly release ground-filtered water, allowing streams to flow perpetually; without seeps (i.e., imagining every surface was impermeable), all rain would run off immediately after it fell, leaving dry creek and river beds without water reserves flowing for drier times. Unlike snowcapped mountain regions, water from melting snow and ice contributes to waterways for only a short time in the Mid-Atlantic states. Depending on the underground reservoir size and depth, seeps continue dripping water from days to months without a replenishing rain.

Figure 1. This seep, seen with its waters reflecting skylight, trickles from a small, subterranean reservoir. It is in a fern gully at Royal Lake Park's entrance near Gainsborough Drive and Claridge Court. It continues oozing groundwater long after rainwater ceases flowing from the nearby storm drain outfall.

In addition to feeding and enlarging waterways, enabling them to support fish and other aquatic life, seeps create their own unique ecosystem. When the ground water loses dissolved oxygen either naturally (e.g., passing through rotting vegetation) or through human-induced contamination (e.g., petroleum spills, septic fields), seep areas appear red or rust-colored. Iron-reducing bacteria, which live on the anoxic and oxygenated zone interface, are responsible for this discolored ooze. Simply stated, the bacteria derive energy from dissolved iron, organic compounds and nitrates resulting in iron oxide (rust) as a waste product. On a macro-scale, seeps give rise to

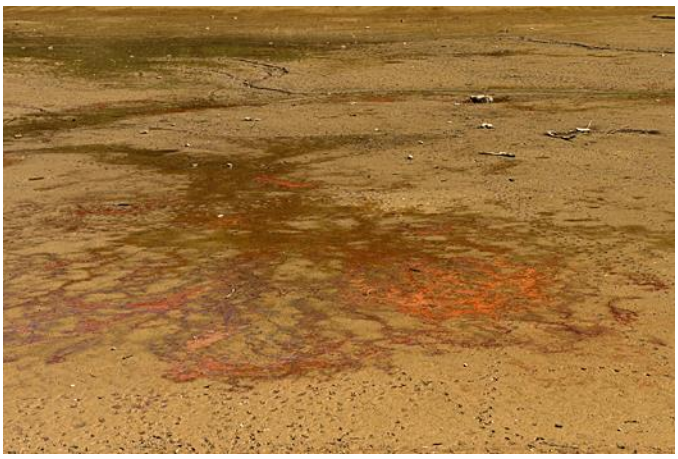

Figure 2. During Royal Lake's dredge (2016-17), the previously submerged ground displayed iron seeps that veined into a wet lattice before reaching Shanes Creek. These areas remained soggy throughout the dry dredge even after vegetation concealed portions of this watery network. A polarizing filter cut glare to show the seeps' red coloration.

specialized plant communities, such as magnolia bogs, which are named after the large and predominant sweetbay magnolias (*Magnolia virginiana*). Other plants found here may include skunk cabbage (*Symplocarpus foetidus*), cinnamon fern (*Osmundastrum cinnamomeum*), blueberries (*Vaccinium* sp.), and club mosses (*Lycopodium* sp.). Starting right where the water springs from the ground, seeps are especially important homes and nurseries for many amphibian species since its waters lack hungry fish that would eat eggs and tadpoles. Birds, mammals, insects, and other animals find ways to benefit from this habitat. A distinctive feature about bogs is that the water perpetually runs except in extreme droughts. The ground is alive as water trickles through the bog just like life-giving blood flows through capillaries. Even though the water movement is slow and might appear to be stationary, it is not a stagnant pool or mud puddle.

Figure 3. A closeup of an iron seep during the lake dredge shows where it bubbles from the ground (bottom) and then flows down a gentle slope.

These sensitive ecosystems number a fraction of what used to be present due to habitat loss, especially overdevelopment. Pavement blocks water from soaking into the ground and recharging the aquafer. In their rush and greed to rapidly squeeze as many houses as possible into a new subdevelopment, some builders inappropriately placed homes on seeps or shallow water tables. The result is a perpetually wet basement. Unlike a seep, surface runoff is what wets a basement for several hours after a storm and then the area dries out. Seeps can occur on lawns or keep sidewalks wet for days or weeks after the last rain. The pavement can be a slip hazard as it becomes slick, especially with algae growth or when iced over. Again, this phenomenon is different from natural runoff or openings from buried gutter downspouts poorly placed next to sidewalks. Regarding gutter drains, the best practice is to have them open no more than 15 feet from the house so the water filters into the soil; unloading this water onto pavement contributes to potential slip hazards. Without ground filtration, any filth that settled on the roof is carried into storm drains where it discharges directly into streams. Better yet, direct roof water into rain barrels or a rain garden! Planting trees and converting lawns into biodiverse native gardens help absorb water away from the house. Anyone still having problems with moisture or floods in the basement should contact a professional contractor to explore remedial options.

Additional information on seeps is available at:

https://www.arlingtonmagazine.com/bogged-down/
https://www.dcr.virginia.gov/natural-heritage/natural-communities/ncpc4
https://www.usgs.gov/special-topic/water-science-school/science/springs-and-water-cycle?qt-science_center_objects=0#qt-science_center_objects

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