

## SPRINGS OF THE COWPASTURE RIVER VALLEY

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*Editor's note: The following essay is the fourth in a five-year series on water resources stewardship in the Cowpasture River Watershed, sponsored by the Cowpasture River Preservation Association and published by The Recorder. The goal of the series is to create awareness among students, citizens and officials of the critical need to protect our surface and ground-water resources, and to stimulate interest in progressive stewardship.*

Springs are critical components of our Cowpasture River watershed. First and foremost, springs keep our rivers flowing when nature does not deliver sufficient rain. Second, springs supply cool, clear and historically potable water for human beings and livestock. And springs inspire a nostalgic image of rural Americana.

Homestead Resource – Springs were essential to the early pioneers who settled in the Cowpasture River drainage. The Scotch Irish entered the Cowpasture River valley, primarily through Panther Gap. Settling first at the mouth of the Cowpasture and Jackson Rivers, these pioneers moved up the river valleys selecting spring sites for the places to build their homesteads. In addition to using the water for drinking, cooking and bathing, spring houses were built to function as pioneer refrigerators to store milk, butter and other dairy products. Many of the larger springs were also used as power sources for gristmills to grind the grain raised by nearby farms and for sawmills to cut timbers, planks and lumber.

Therapeutic Properties – From the late 1700s and into the late 1800s, springs were thought to have therapeutic properties and a healthcare industry was centered on the purported healing properties of mineral springs. Hotels and resorts were built to receive the influx of those seeking relief of their ailments. Healthcare combined with tourism during the summer months attracted visitors to mineral springs in the mountains of western Virginia. Although much of this tourism took place in the Warm Springs valley of Bath County, some of these mineral springs resorts were located in the Cowpasture River valley. In Millboro Springs there was a 100 guest hotel. Nine miles to the south along Virginia Route 42 there is a retreat at Nimrod Hall Springs whose activities date back to 1783. At Bath Alum Springs there were six springs each having its own particular brew of mineral properties and a large three-story main hotel that offered 98 large rooms each with a fireplace.

Water Supplies – As populations within the Cowpasture River valley grew, karst springs became the principal water supply for entire communities. In the mid-1800s, the Longdale Iron Company, pressed by surface water pollution from logging, iron ore mining, limestone quarrying and iron smelting, developed mountain springs to supply cool, clear and potable water for the

company and its employees. One hundred and seventy-five years later in the Cowpasture River valley only the unincorporated communities of Longdale Furnace and Millboro are still using springs for community water supplies. U.S. National Primary Drinking Water Regulations now mandate water treatment to ensure purification. Fifty years ago, rural springs were considered pure and rural families and visitors alike did not hesitate to fill a bucket or canteen with that pure sweet mountain spring water. Now most people are aware of the possible contamination of spring water by *E. coli* (a bacteria) or by *Giardia lamblia* (a flagellated protozoan). Both pathogens originate in human and animal wastes, and today compromise water quality in many springs that were formally considered safe for drinking. A widely held misconception is that impurities in underground streams are filtered by the rock and sands, and thus, these streams deliver pure potable water as they flow to the surface as mountain springs. In karst terrain this may not be true because large cave passages can quickly channel underground streams from point A to point B without filtering the impurities. The water flowing from what looks like a pure mountain spring might actually be coming from a cow or sheep pasture many miles away.

Trout Farms – The most widespread commercial use of springs has been to raise trout. There are a number of old fish runs, mostly now abandoned, and scattered throughout the Cowpasture River basin. Offering guests a fine meal of mountain trout was and still is, an important menu item in country restaurants and hotel dining rooms. Trout fishing continues to be a popular outdoor recreation activity and the Virginia Department of Inland Game and Fisheries has remodeled its out-dated fish runs just south of Williamsville. The new Coursey Springs Fish Cultural Station is considered a state-of-the Art facility and thus, in the twenty-first century makes the best possible use of reportedly one of the largest and coldest fresh water spring in Virginia.

Measuring Flow – The Cowpasture River basin contains some of the largest springs in the state. The size of the spring usually refers to the amount of water flowing from the spring. This is called the springs' flow rate. It is usually expressed in cubic feet per second (CFS), gallons per minute (GPM), or gallons per day (GPD). One CFS is equivalent to about 450 gallons per minute or over a half million gallons per day. Gallons per minutes will be the measurement used for this essay. Generally a spring having a flow rate of 450 gallons a minute or greater is considered a large spring in this area. However it is difficult to determine a meaningful flow rate of most karst springs because they can change their flow by orders of magnitude due to changing weather conditions. As an illustration, the Coursey Springs Fish Cultural Station measures its high volume storm-related flow at about 13,000 gallons per minute and its low volume drought flow at about 3,500 gallons per minute. Nonetheless, most if not all the largest springs are karst springs.

Geologic Formations – All together, there are probably thousands of springs in the Cowpasture River drainage. They come in all sizes and shapes. Some flow from beneath rock ledges and

some flow from soggy marshes. It all depends upon geology and hydrology. Most of the rock formations in the Cowpasture River basin are sandstone, shale, or limestone. Each of these rock types affect springs in different ways. Shale has the greatest resistance to the passage of ground water. Most shale springs have an iron taste and sometimes have a smell of sulfur. A sheen of oil might be seen on the surface of water of a shale spring. Sandstone can have coarse grains with fissures and cracks that allow for a much greater flow rate than shale. Sandstone springs generally flow clear and contain only a few traces of minerals. They also provide a more constant flow of water than springs from other rock types. Limestone springs, also called karst springs, generally have the largest flow rates in the basin. This is because the water flowing through the limestone can be slightly acidic and so it enlarges the fissures and cracks, allowing for a faster flow rate. It is not unusual for a cave to be associated with a limestone spring. For example there are four large limestone springs in the water gap (called the Bullpasture Gorge) where the Bullpasture River cuts through the Bullpasture Mountain. The underground streams that resurge as springs are known to flow through large cave passages. Cave passages can be thought of as large pipes or conduits with little restriction to flow and many limestone springs have a highly variable flow rate. A crystal-clear flow issuing from a small limestone spring can be transformed into a raging mud colored torrent by sudden heavy rain. The muddy water comes from distant sinking streams.

Cowpasture Springs – There are several types of springs but four are of particular interest in the Cowpasture River drainage – gravity, artesian, periodic, and karst springs. Gravity springs are those where groundwater flows from a higher source at a relatively shallow depth before emerging at the surface. Gravity springs are the most common type of spring.

Artesian springs may have the same surface appearance as a gravity spring but the flow of water comes up from some depth under pressure. There are at least two large springs in the Bullpasture Gorge that are artesian springs. Both of these springs are adjacent to the Bullpasture River. The springs are fed from underground streams following cave passages that descend steeply downward to a great depth.

Periodic springs, sometimes called the ebb and flow springs, are rare. There are perhaps less than a dozen known periodic springs in Virginia. The flow from this type of spring is not constant but varies in a rhythmic fashion. In some instances the flow from a periodic spring can stop altogether for a period of time from several minutes to several hours and then resume flowing. There is a periodic spring several miles south of Williamsville that was described in Oren F. Morton's, *The Annals of Bath County, Virginia*. It was reported that this periodic spring when it was boldly flowing powered a gristmill not far downstream and that when the spring resumed its bold flow the miller would ring a bell assembling his assistants to operate the mill.

Karst springs are found in landscapes with limestone rock formations that over geologic time spans become weathered or water-dissolved and feature limestone ledges, sinkholes, blind valleys, caves, big springs, and losing (or sinking) streams. Sinking streams can lose their water gradually before the stream bed becomes entirely dry. Or the reverse can be true, the stream can disappear abruptly into a hole in the streambed or flow into a cave entrance at the end of a blind valley. Regardless, all sinking streams must re-surge to the surface as a spring. Among karst terrain experts, the general wisdom states that, “what goes down, must come up”. But the intriguing questions for explorers become in what direction, at what distance and where will the water come up?

A future issue of *The Recorder* will publish the sequel to this initial essay on springs of the Cowpasture. Look forward to a second installment titled, “EXPLORING KARST SPRINGS IN THE COWPASTURE WATERSHED”. Phil Lucas will describe sleuthing with dye traces, diving into spring caves, measuring the water flow from springs and water quality analysis.

#### **Internet Research URLs:**

Caves, springs and geology. See <http://www.virginiacaves.org/>

World-wide springs hydrology. See [http://en.wikipedia.org/wiki/Spring\\_%28hydrology%29](http://en.wikipedia.org/wiki/Spring_%28hydrology%29)

#### **Published Book References:**

Stan Cohen, Historic Springs of the Virginias (Missoula, Montana: Pictorial Histories Printing Company, 1981), 218 pages.

Neven Kresic, Water in Karst: Management, Vulnerability, and Restoration (New York, New York: McGraw-Hill Professional, 2013), 736 pages.

#### **Essays in Water Resources Stewardship:**

Sponsored by the Cowpasture River Preservation Association

Edited by C. Nelson Hoy of Williamsville

Published for the purposes of creating awareness and stimulating interest in more enlightened water resources stewardship.



Aqua Spring in the Bullpasture River Gorge during a period of normal water flow.



Aqua Spring in the Bullpasture River Gorge after heavy rains and floods.