Chapter 9

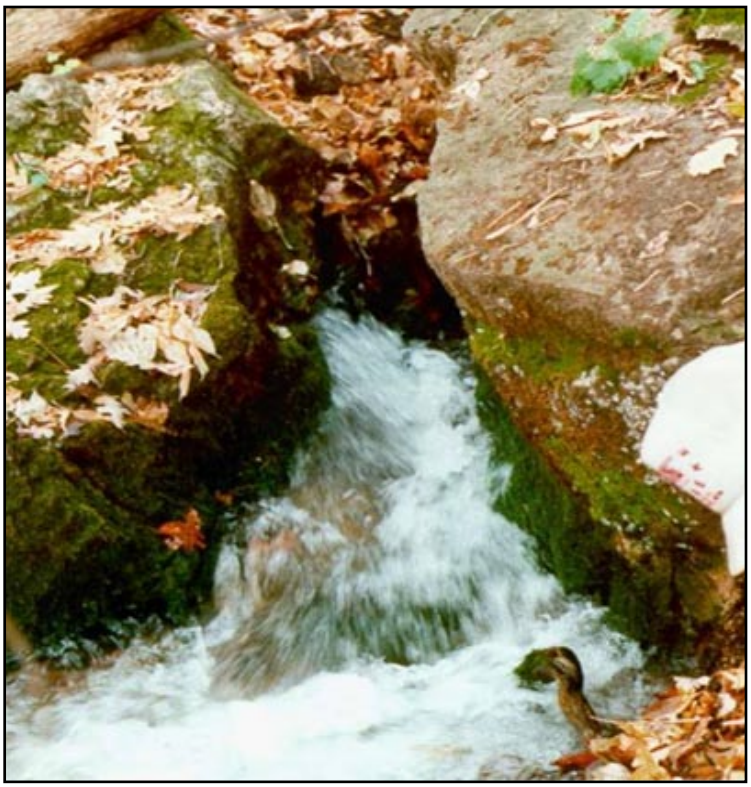
Springs

Springs are the locations where water discharges out of the ground onto the land surface. As mentioned earlier, springs are a unique setting in that they are a transition between ground water and surface water. Because of this, when hydrologists studying an area are categorizing water into either ground water or surface water, springs can represent both. Obviously, once the water is out of the ground and on the land surface, it becomes surface water. But, because the water is being discharged from the ground, hydrologists can sample it for water quality, age dates, and other factors measured in ground water. Plus, if one is measuring the depth to ground water in an area, springs represent the zero depth. Therefore, springs can be labeled as ground water and surface water.

Scientists are good at taking a topic and breaking it into many numerous categories and definitions based on small variations. Springs are no exception and many different types of springs can be discussed. However, for most of Nevada, springs can broken into five groups: fracture springs, bedding springs, alluvial-fan springs, water-table springs, and basin springs. Various scientific terms are used for different types of springs and many subcategories for each, but for this general discussion, these five labels will work just fine.

Just as a side note, springs can usually be identified on maps and aerial photographs by the concentration of trees and plants in specific locations. Springs provide the water to support abundant plant life in areas where little else grows. So, maps and aerial photographs are useful tools for finding springs.

In the canyons of the mountains throughout Nevada, springs often occur right out of the bedrock. These are fracture springs. Rainfall and snowmelt in the mountains seeps into cracks and fractures in the bedrock and travels underground through these openings until it reaches a low area such as a canyon. At this point, the water seeps out of the fractures and onto the surface. In most settings, the water in fracture springs is pretty recent in age, meaning that the water that seeps into the cracks and fractures as precipitation and snowmelt moves relatively quickly to the springs.



Spring discharging from fractured bedrock (hat for scale). Photograph by M.L. Strobel, USGS.

Bedding springs also are noticeable in the mountain and canyon areas. When one type of rock is setting on top of a different type of rock, it is called bedding. A good example of bedding is the Grand Canyon, where one can see many different layers of rocks stacked on top of each other like a stack of pancakes. Some rocks can transmit water easier than others (refer to previous chapters that discussed aquifers and confining units). When a rock type that transmits water easily sits above a rock type that is mostly impermeable, the water in the upper rocks tends to move laterally instead of downward. So, when there is a canyon where both rock types are exposed, the water in the upper rocks will seep out right at their base where they overlie the impermeable rocks. Quite often, bedding springs are the locations of vegetation such as trees and bushes that occur on the walls of canyons.

An alluvial fan is the area of rocks and sand at the mouth of a canyon coming off of the mountains. As water moves down a canyon, it carries sediment with it. The sediment can get deposited out onto the valley floor as the stream leaves the canyon. Over many years, the sediments build up and form a fan-shaped feature near the mouth of a canyon (similar in principle to a river delta) which is called an alluvial fan. In some cases, streams leaving the mountain canyons can disappear into the ground near the tops of alluvial fans because the fans are so porous. However, this water will seep back out near the base of the fans. These are alluvial-fan springs. Often, homes and clusters of trees are situated at the base of alluvial fans in Nevada where these springs occur.

Water-table springs occur near the middle of valleys in the Basin and Range of Nevada. This is where the ground water is high enough to intersect land surface and the water exits the ground. Typically these areas are locations of wetlands or lakes. Some people would not call these springs because the water does not actually "spring" out onto the surface as it does in the previous examples. But nevertheless, it is ground water discharging onto the surface and therefore can be considered a spring.

The last type is what we are calling basin springs. Ground water tends to move downgradient within a basin and tries to discharge into the next basin. Often, as the ground water encounters less permeable rocks at the low end of the basin, it gets backed up and seeps out onto the surface. This seepage at the end of a basin is a basin spring. The huge ground-water flow system in eastern Nevada is a series of basins that extend from White Pine County southward to near the Colorado River. At the end of this flow system are a number of basin springs (such as Muddy Springs) where the ground water moving downgradient in the basins gets discharged to the surface. The amount of water being discharged at these springs is not a huge quantity, but it is a pretty steady rate of discharge and represents a very large flow system.

Springs are very useful to hydrologists for looking at changes in natural conditions. In all five examples, changes in the amount of water being discharged at springs would indicate changes in the water balance of an area. Reduced recharge from precipitation and snowmelt, such as what occurs during a drought, can decrease the amount and duration of flow from springs. Changes in ET due to changes in the type and amount of vegetation cover can alter ground-water levels and affect spring discharge. Human impacts from pumping certainly can have an affect on the ground-water levels and availability of water to feed the springs. Scientists can use data from springs to make conclusions about how various factors, both natural and human, are affecting the water resources in an area.