

Reconstruction of the water collection system at the spring above the Avalanche Creek campground.

Introduction

The water source for the Avalanche Creek campground is from a spring located about ¼ mile east (up Avalanche Creek) from the campground. A memo in the water rights docket for this source indicates that a survey of the water line was made in June of 1940, so the water system is at least that old. We have no records regarding the design or construction of the collection system at the spring. There are no records to indicate that any repair/rehab work has been done at the collection system since then.

Montana DEQ completed review of the water source in January 2002 and classified it as “groundwater under the direct influence of surface water.” Continued use of water from this source would require an upgrade to meet the standards for surface water treatment. Another option is to reconstruct the infiltration gallery at the spring and the transmission and distribution system and then reevaluation of the system to see if it can be reclassified as a groundwater source. The third option is to abandon the spring and construct a water-supply well at the campground.

This report will focus on the reconstruction of the infiltration gallery at the spring. Conversations with DEQ staff have made it very clear that is highly unlikely that the existing system would ever be reclassified as a groundwater source because we have no information regarding the design and construction of the system.

There is no guarantee that reconstruction of the infiltration gallery will result in reclassification of the spring as a groundwater source. In fact, because of the hydrogeologic setting of the spring, it's likely that the spring would remain classified as groundwater under the direct influence of surface water.

Hydrogeologic Setting

The spring occurs at the base of a talus slope below an avalanche chute on the west side of Mt. Cannon as shown in Figure 1. The bedrock formations comprising the mountains are relatively impermeable and are not likely a source of water for the spring. Large masses of broken rock lie at the base of the mountain; large boulders and rock fragments that have eroded and tumbled down the mountain, or have been swept down by avalanches.

Rain and snowmelt infiltrating the talus is the most likely source of recharge for the spring. We would not expect that there would be a clay layer or any other geologic feature to protect the source area of the spring from infiltration of potential contaminants. There have been no reported occurrences of contaminants in the spring water in the past, but there are no natural barriers to prevent contamination either. If a bear did what bears do in the woods, or an elk carcass was rotting on the ground immediately above the spring discharge area, the water could become contaminated, although it would probably be a transient occurrence.

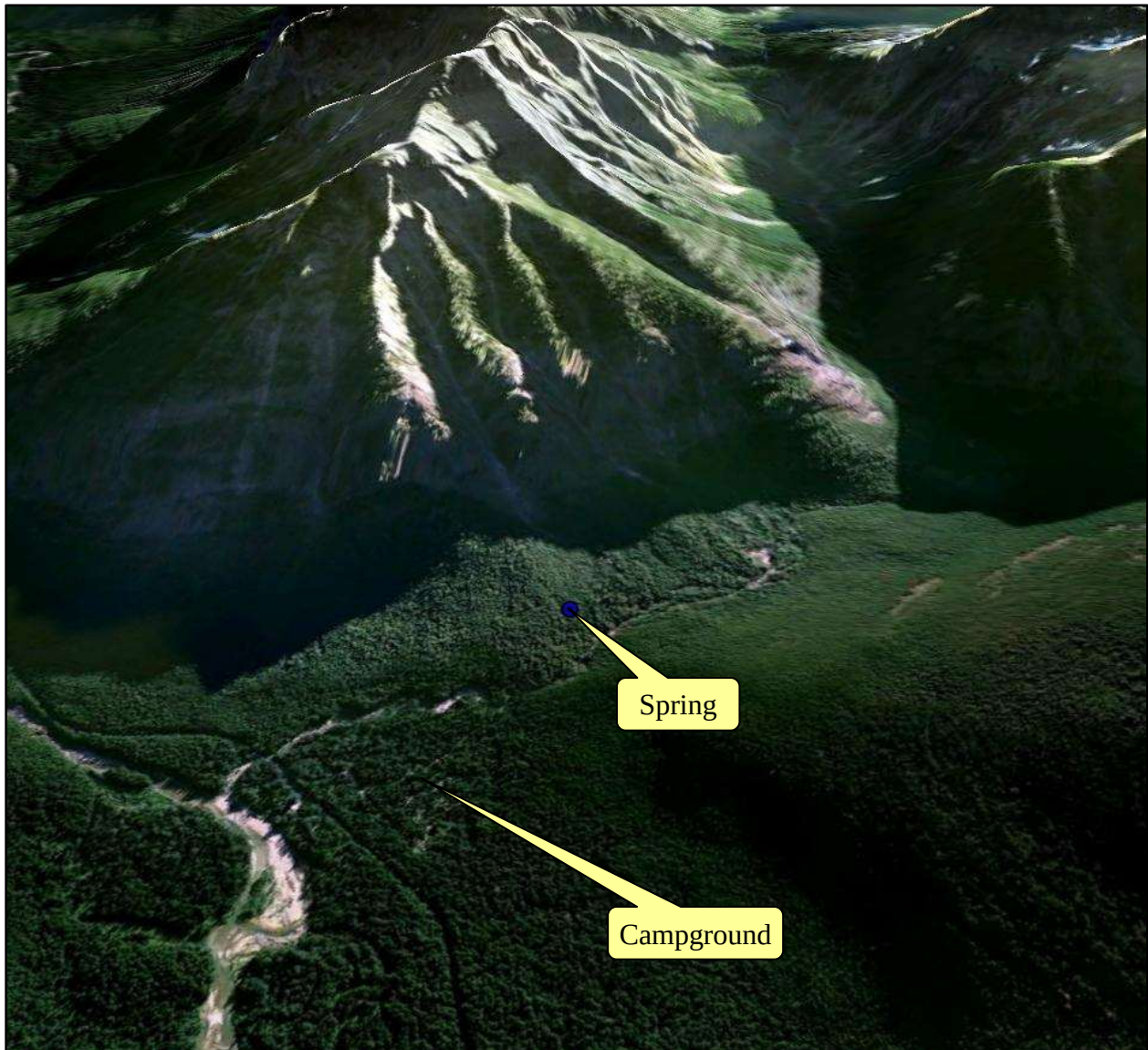


Figure 1. Screenshot from GoogleEarth of the Avalanche Creek area. View is northeasterly.

In developing springs for water supplies, we prefer to have a source where the groundwater occurs in a geologic stratum that is covered by a low permeability layer to prevent infiltration of contaminants from the surface. Figure 2 shows a sketch of the hydrogeologic setting for two types of springs. We would prefer to have a situation similar to that shown in the sketch on the left, where an impervious layer prevents infiltration of contaminants to the aquifer. It is more likely that at Avalanche Creek we have a situation more closely resembling that shown on the right, where there are no geologic strata to impede infiltration of water and contaminants from the surface to the aquifer.

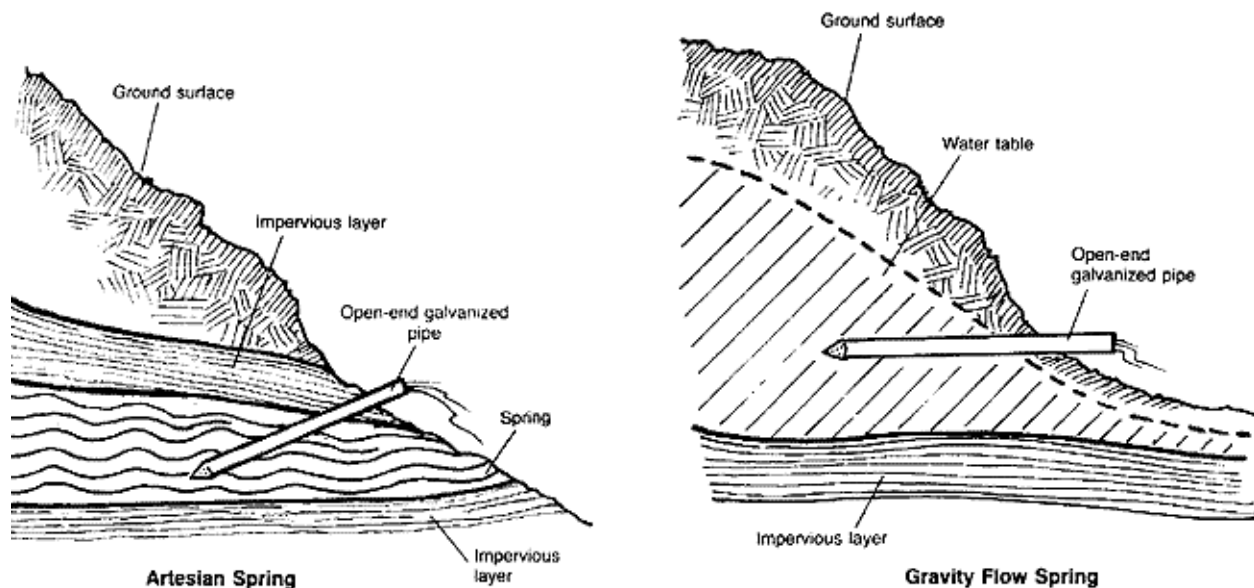


Figure 2. Sketch showing a spring protected by an overlying impervious layer on the left and a spring with no protection from contaminant infiltration on the right. The spring at Avalanche Creek is probably more similar to the setting shown on the right.
Source; <http://www.lifewater.org/resources/rws1/rws1m.htm#SS>

Reconstruction of the collection system

Complete reconstruction of the collection system at the spring would be extremely difficult and unlikely to provide any additional protection from contamination. If the construction work must be done by hand, because of wilderness area restrictions, reconstruction will be nearly impossible.

Typically, construction of a collection system requires excavation of multiple trenches back into the hillside, with the bottom of the trenches dug below the water table. The trenches are then lined with permeable filter fabric, a layer of gravel is placed, perforated pipe is laid on the gravel and covered by more gravel and another layer of filter fabric. The collection area is then covered with a layer of clay or an impermeable liner to prevent surface infiltration directly over the collection area. Each of the perforated pipes is connected by additional piping and the flow is routed to a spring box. A diversion ditch should be constructed uphill of the collector pipes to divert surface runoff from the collection area. The design is almost identical to a septic leachfield, except the perforated pipe is below the water table and the system is graded to collect water in the springbox rather than dispersing it from a septic tank. A cross-section sketch of a typical design is shown in Figure 3.

A plan view of a typical spring collection system is shown in Figure 4. We might only need one collector trench, we might need several. Likewise the distance we would need to excavate back into the hillside could not be determined until work begins and we see how much water is flowing as the excavation is extended; 10-20 feet would be the minimum amount of excavation.

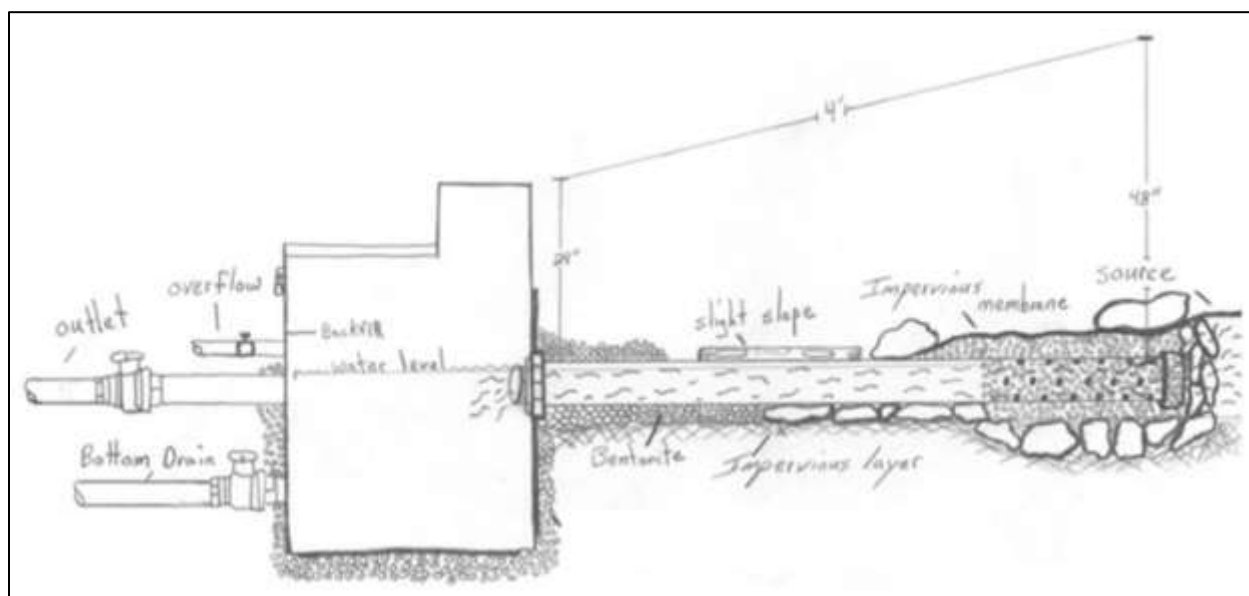


Figure 3. Cross-section sketch of a typical spring design.

Source; <http://aquariusspringbox.net/InstallationAndMaintenanceManual.aspx>

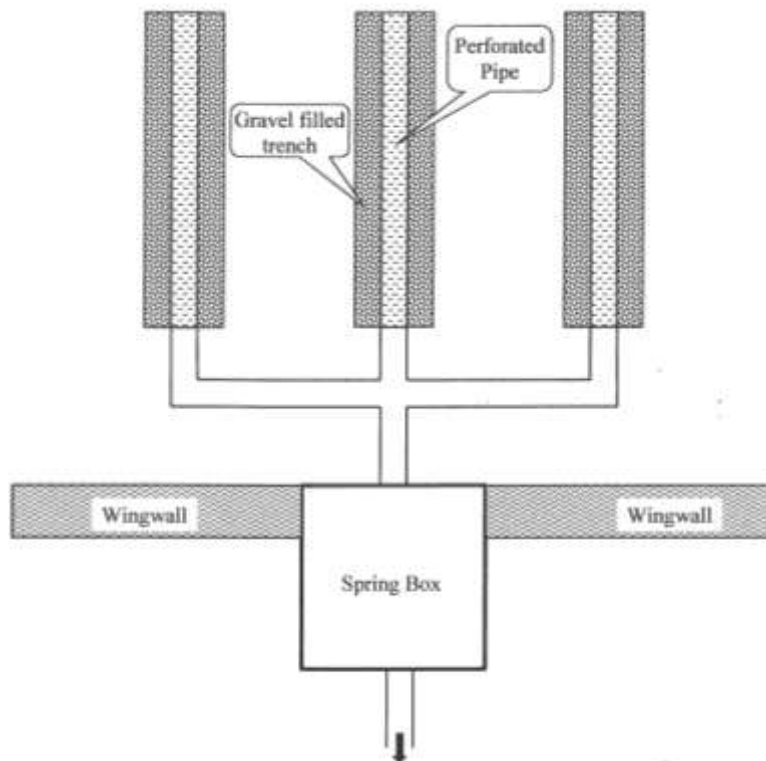


Figure 4. Plan view of a typical spring collector system.

Alternatives to complete reconstruction

Discussions with Montana DEQ personnel should be initiated to determine what efforts by NPS will be necessary to receive serious consideration toward reclassifying the spring source as groundwater, rather than groundwater under the direct influence of surface water. It may be that even complete reconstruction of the collection system will not be sufficient to achieve groundwater designation because the spring area will remain susceptible to contamination from surface infiltration. If that is the case, then we have little to gain by doing a complete reconstruction. Our efforts might be better spent in maintenance projects after the collector pipe emerges from the hillside. These efforts might include all or various combinations of the following;

1. Remove the downed timber and other debris from the presumed collection area.
2. Remove trees, bushes, and other large vegetation from the presumed collection area. The goal is eliminate as much root structure as possible as they might provide an avenue for rapid infiltration from the surface.
3. Fence the area around the presumed extent of the existing collection system a minimum of 50 feet and preferably 100 feet upgradient of the spring and 20 feet downgradient from the spring to keep large animals away from the collection area.
4. Cover the collection area with a clay layer or an impermeable liner (at least 40 mils) at least 15 feet in all directions from the existing collection system. It may be necessary to first place a layer of soil to protect the liner from puncture by rocks. The liner should be covered by a layer of soil at least two feet thick.
5. Construct impervious wingwalls where the springs and existing pipe emerge from the hillside. The wingwalls will help maintain the water level in the area of the collector pipe when the pond is drained (see following item).
6. Breach the wooden dam and regrade the area as necessary to eliminate ponding of water in the vicinity of the collection system.
7. Repair/replace the transmission line from the spring to the campground to eliminate all leaks and any potential areas where surface water might enter the transmission line. The transmission line should never be under water in the creek or any surface water pool along its entire route.
8. Repair leaks in the distribution lines throughout the campground to eliminate any potential pathways for untreated water to enter the system.

Montana DEQ has a publication, Circular 11, which describes construction standards for development of springs (<http://deq.mt.gov/wqinfo/circulars.mcp>). Utah Division of Drinking Water also has guidelines for development of springs as water sources http://www.drinkingwater.utah.gov/documents/rules_ddw_version/R309-515_5-13-10.pdf. Aquarius Springbox LLC. Has a guide to installation and maintenance of a springbox and collection system <http://aquariusspringbox.net/InstallationAndMaintenanceManual.aspx> and photos of a couple of installation projects <http://aquariusspringbox.net/default.aspx>.