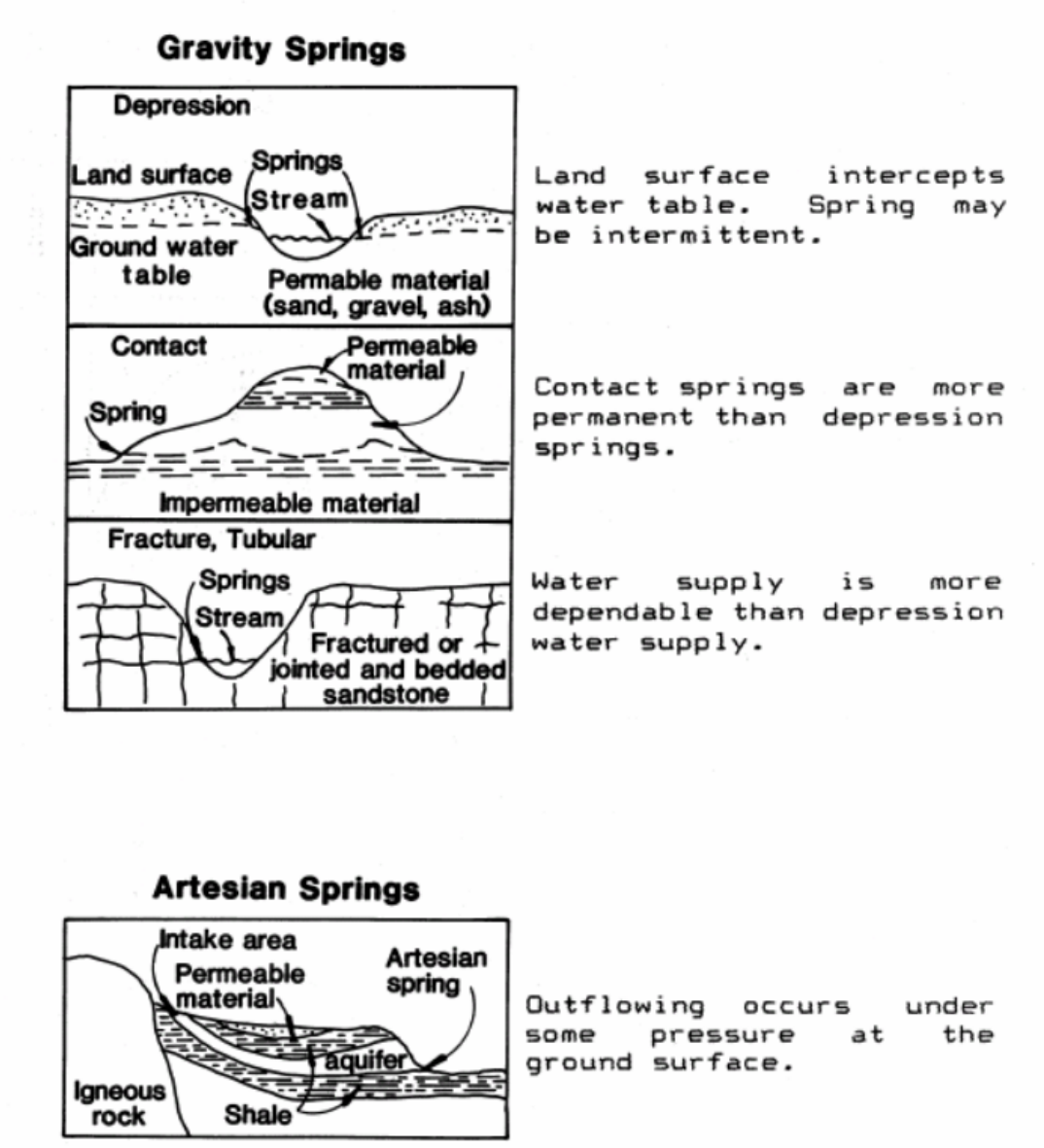
Spring Development

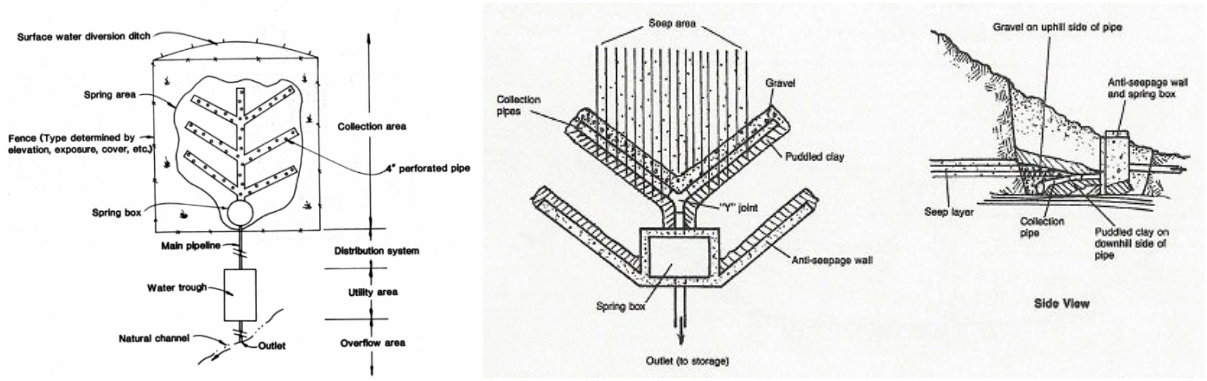
General description of spring developments
Compiled by the Range Department, Blue Mountain Ranger District, Malheur National Forest
December, 2017

Description

Geologically, springs used to develop stock water are two types, gravity and artesian. There are three classes of gravity springs: depression springs the ground surface drops below the water table; perched or contact springs-the ground water is collected on an impervious stratum and surfaces on the side of a hill; and fractured and tubular springs-the water emerges from impermeable rock strata through fractures, joints, bedding planes, or solution tunnels. Depression springs are mostly intermittent and depend on seasonal rain or snow. Contact, fracture, and tubular springs are more dependable than depression springs. Artesian springs result when water enters a permeable stratum at a higher elevation than the outflow. This water is channeled downward between two impervious strata and surfaces under pressure. A graphic of the different types of spring is shown below.



Spring developments typically consist of a water collection system, either above or below ground; a storage system; and a water distribution system. Where the water supply is adequate, the storage system is incorporated into the collection system, distribution system, and water troughs, including the storage capacity of the pipe.



Each spring development depends on the water source, rate of flow, and the quantity of water needed, as well as available forage, slope, ecosystem, proximity to roads, wildlife use, and accessibility to equipment. The water collection system is usually protected with either wire fencing or brush fence. The water is piped from the spring source to the water trough, underground. The overflow flow the water trough is piped underground back to the natural channel.

Equipment

The equipment needed to develop springs depends on the site. In many cases, only hand tools are needed, but backhoes may be needed at springs requiring excavation or where more than a few feet of pipe are to be buried. Additionally, depending on the distance from the source the trough will be installed, a backhoe would be necessary to effectively burry the inlet and overflow pipes.

Materials

Depending on the spring development, materials may include 1.5-inch plastic and galvanized pipe, 4-inch-diameter perforated tile or plastic pipe, pipe fittings, storage tank, treated posts, fence wire, gravel, spring box, and bentonite.

Specifications

Water collection system: Water can be collected from a surface ditch, but it is better to dig to firm ground, hardpan, or rock to obtain ideal flow. Perforated tile or plastic pipe or unglazed open-joint tile buried in a trench with 1.5- to 3-inch clean gravel may also be used to collect spring water where the source cannot be located. If the source can be located, the water can be collected directly into a spring box. Sealing the downhill side of trenches with plastic or bentonite may be necessary to contain the water into the spring box. Some spring developments do not need spring boxes, and the water goes directly into the distribution or storage system. The collection pipe is coupled directly to the outlet pipe by a reducer. In some cases a "no-hub" coupler may be needed if the proper reducer is not available, especially when 4-inch tile is used to collect the water.

Spring box: Generally, the water is concentrated into a headworks, or spring box, that can be opened periodically for inspection and maintenance. Spring boxes are typically made of galvanized metal with a lid to ensure that they are always covered. Spring boxes are best buried and the location marked with a steel or treated wooden post for maximum protection from livestock and human activity. Burying spring boxes also prevents contamination from debris and small animals falling into the water, vegetation from growing in the water, and injury to livestock or people. Typically, the lid (top) of the spring box is at ground level after the box is buried. This allows for the maximum protection of the spring box while still allowing it to be cleaned and inspected. Fencing the source of water is usually desirable where the ground is wet or boggy, or the water must be collected by tile, drains, or other means. Log-crib fences are effective in fencing water sources and need little maintenance. If the water comes from a single source and if the spring area itself is not subject to trampling, the area may be covered rather than fenced. Boggy areas that are typically damaged by trampling of livestock should be entirely protected.

Water Troughs

Description

Different types of troughs can be purchased, from manufactured round and rectangular metal troughs complete with inlet and outlet pipe fittings to bottomless, round troughs with corrugated-metal side sections that are assembled at the site and have a poured concrete bottom. Troughs, except bottomless troughs, are typically placed on either a concrete or a treated-timber foundation, and gravel is spread around the trough to keep the area from becoming a muddy bog. Aluminum, rubber, and galvanized troughs do not need to be placed on a foundation because they will not rust due to the moisture in the ground. The size of the trough may be determined by the amount of water needed for a single drinking period, as well as by the rate of flow and the storage capacity of the system. Typically the water troughs used will be rectangular, 4’ x 8’ x 2’ and will store approximately 400 gallons of water.

Application

Water troughs are appropriate at any location where water is needed for livestock, including such sites as ponds. Troughs may also be located in areas with no water source and the water hauled in by a tank truck. Water provided in troughs from springs is of higher quality than water available from stock ponds. This is because livestock and wildlife cannot walk, urinate, or defecate in the trough and the water in troughs is typically flowing and colder than the stagnant and warm water typically found in ponds.

Equipment

Equipment is needed to transport the trough, gravel, timbers, or concrete, depending on the foundation specifications, and to prepare a level location. If the trough is to be located at the same time a water source is being developed, the necessary equipment may already be available. A pipe tap may be needed to clean metal pipe threads of rust, rolled edges, dirt, or paint.

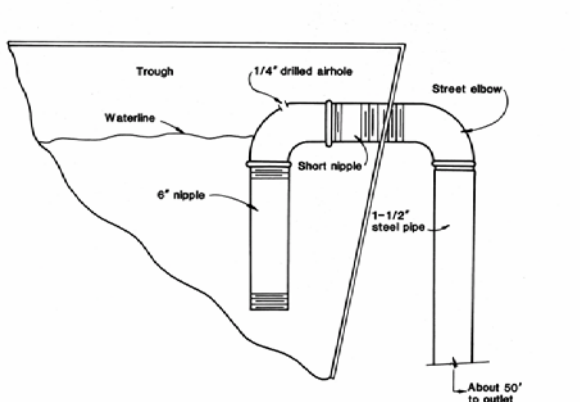
Specifications

Even if the water source is some distance away, all troughs will be located on level, solid ground to minimize maintenance costs and increase use. It is preferable to locate troughs on a rocky surface or spread a layer of coarse gravel over a 10-foot area around the trough to prevent trampling during wet weather. It is preferable for troughs to be located far enough away from trees so that needles or leaves cannot drop into the trough and potentially clog the overflow outlet. However, in a forested system, this is not always practical.

Water supply, overflows, and outlets

Plastic pipe is generally of sufficient strength to connect troughs with the water source. The exceptions are where the pipe is exposed at the trough; steel pipe should be used at these locations. The supply pipe typically passes through the trough at the top or over the side and down into the water. Pipe is buried from the source (spring box) to the trough, and from the trough to the desired location (existing channel).

The overflow pipe is at least the same size, if not larger than the inlet pipe and is generally located at the opposite side or end of the trough. The outlet pipe begins about 6 inches below the water level, which helps to keep the pipe from becoming clogged; a "reverse head" has an airhole drilled in the top to prevent siphoning (figure below). Overflow water is carried far enough away from the trough area to prevent a wet area in the vicinity of the trough, preferably back into a natural watercourse.



Small mammal and bird escape ramps

Small mammals and birds are attracted to any source of water and may fall into troughs with steep sides and drown. Dead animals contaminate the water and discourage use by livestock. All troughs are equipped with a wildlife escape ramp. It can be as simple as a board with one end floating in the water and the other end secured to the top rim of the tank or to a post adjacent to the tank. The board is best located along the edge of the trough because swimming animals will go to the edge to escape. If the ramp is not at the edge of the trough, they may not find it. Large wooden or plastic foam platforms may also prevent tank damage caused by ice pressure. Expanded metal reinforced with metal straps and welded or wired to the tank rim can also serve as a wildlife escape ramp.