TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE Portland, Oregon SOIL CONSERVATION SERVICE

Range No. 10 August 1979

Attached is a job sheet relating to spring development. It was developed by Emsley Rogers, Soil Conservationist, LaGrande, OR.

It is intended to be used as handout material to landowners who are planning spring developments. It will also be valuable in individual planning "thunder" books.

Additional copies may be ordered from the Plant Sciences Section, Portland State Office.

Attachment

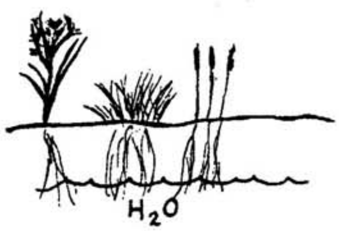
A Few Pointers On

SPRING DEVELOPMENT

Why:

Developing a spring or seep may be the cheapest or only source of water. This practice can increase the usable water, improve availability and protect it from contamination. It may not increase the original flow at the source. It may result in better distribution of livestock and/or increased grazing capacity; it may provide water for irrigation or recreation facilities; and it may lessen the fire danger in some cases.

Where:



Water-loving plants

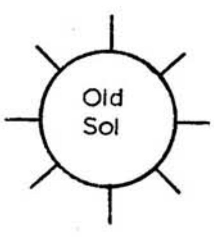
Properly located developments of natural water sources on range and pasture are a key to improved grazing management. Normally, stock water should not be more than ½ mile apart on grazing land.

A <u>spring</u> is defined as a natural outflow of water from the ground surface, usually from a definite opening. A <u>seep</u> is similar but has no definite opening. If no outflow is apparent, look for water-loving or water-tolerant plants. Some of these plants are: yellow nutgrass, baltic rush (tussock), cattail, tule, mint, stinging nettle, wild iris, willow, and alder.

Production of a spring may be determined by measuring the time required to fill a container of known capacity. It is usually measured in gallons per minute (GPM). One GPM equals 1,440 gallons per day. (see *How* #7).

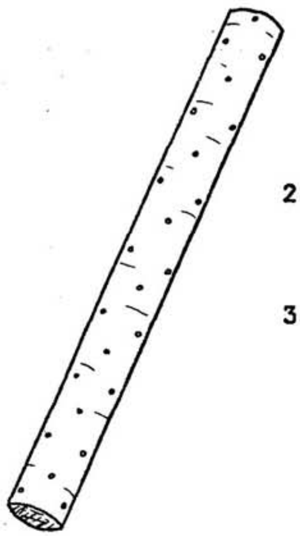
A seep may need to be checked more thoroughly to locate the source of water. Use an auger, spade, or shovel.

When:



Investigate the spring site thoroughly during the latter part of the dry season. Determine the type of spring (see *Further Information*), size of source or extent of wet area, volume of flow, approximate placement of planned facilities (pipes, spring box, watering tank), soil type, vegetation, and accessibility. Minimum flow volumes can best be determined at the driest time of the year. The development should be installed during this period also.

How:



Perforated plastic pipe

1. In cleaning out the opening of a spring or digging along a seepage to locate the true water-bearing outcrop, it is important that the impervious layer of rock, clay, etc. is not penetrated with a shovel, posthole digger, backhoe bucket, or other implement. Many potentially valuable springs have been lost in this way. Allow free discharge from the spring opening.

2. The typical spring development may be divided into three areas: the Collection Area, the Utility Area, and the Overflow Area (see Fig. 1).

3. Lay tile or build impervious cut-off wall to divert water to Spring Collection Box. Four inch drain tile or perforated plastic pipe should be laid in a trench using underground drainage specifications. Care must be taken to intercept all flow to completely utilize the seep and to prevent bogginess around the development. If possible, refrain from putting the collection box directly in a channel.

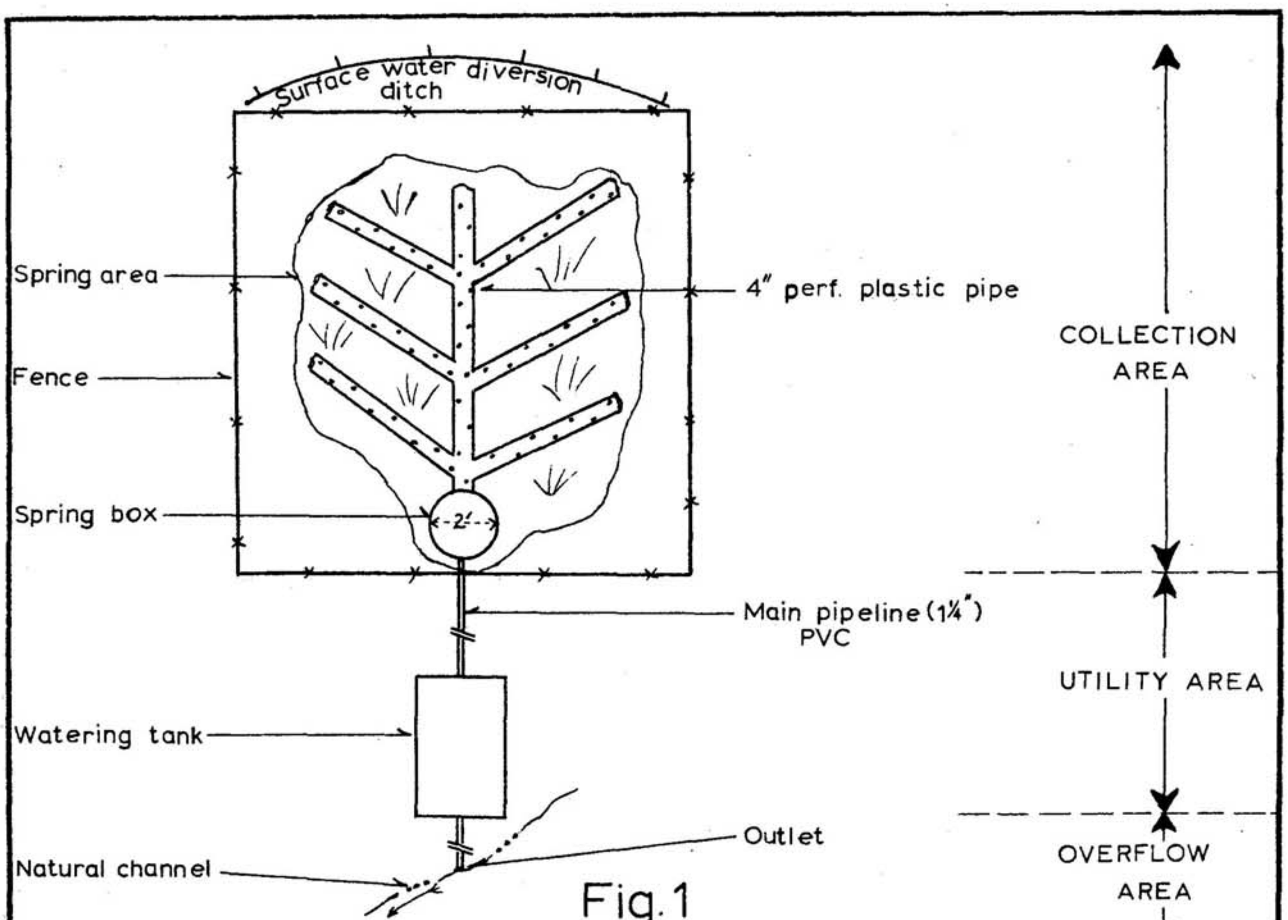
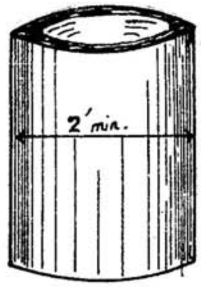


Fig. 1

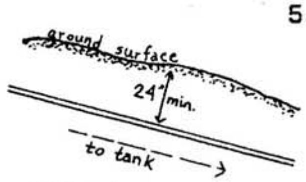
TOP VIEW - Typical Spring Development

How (cont.):



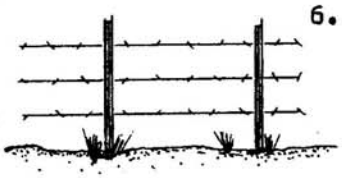
Concrete tile or metal culvert

4. Construct the spring collection box of either masonry, concrete, or use concrete tile or heavy corrugated metal culvert of 24 inch minimum diameter. The box should have a tight, removable cover. If concrete is used, it is necessary that sufficient bracing of the forms is provided to prevent bulging. The aggregate should be clean; the mixing should be carefully done; the mixture should be well tamped and protected from freezing for at least five days. The box should have a minimum cross-sectional area of 2 square feet. The floor of the spring box (including pea gravel) should be not less than 12 inches below the outlet of the collection system. The outlet pipe from the box must be watertight and not less than 6 inches above the floor of the box to provide a sediment trap. The outlet should be screened. (see Fig. 2)



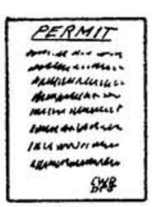
Maintain grade

5. Use good quality plastic or steel pipe (1" minimum, 1¼" diameter recommended) to carry water from the spring box to the stock watering tank or storage reservoir. Connect the pipe to the spring box with a union fitting. The pipeline must be laid on a uniform minimum grade of 1%. To prevent formation of air pockets in the line, make sure there are no reversals in grade. The pipe should be buried to a minimum depth of 24 inches. A clean-out plug should be located in the turn-up elbow at the outlet.



6. Fence or otherwise protect the collection area from stock damage. Have a diversion ditch above the spring for surface water diversion - this is especially important for domestic springs. The stock tank should be level and located in a stable, well-drained area - preferably on a rock or large gravel base. Excess water should outlet into a natural channel away from the tank.

7. Daily stock water requirements vary with kind of feed, weather, etc. As a thumb rule, 12-15 gallons per head per day for cattle and horses, 4 gallons for hogs, and 2 gallons for sheep are required. Domestic requirements: 40-50 gallons per person daily. (If no automatic laundry facilities, 30 gallons per person).



8. A permit to put water to beneficial use is required only if the water emerging from the spring runs off the property on which it first arises. However, it is recommended that an application be submitted on every spring. Forms are available at the Water Resources office in your county.

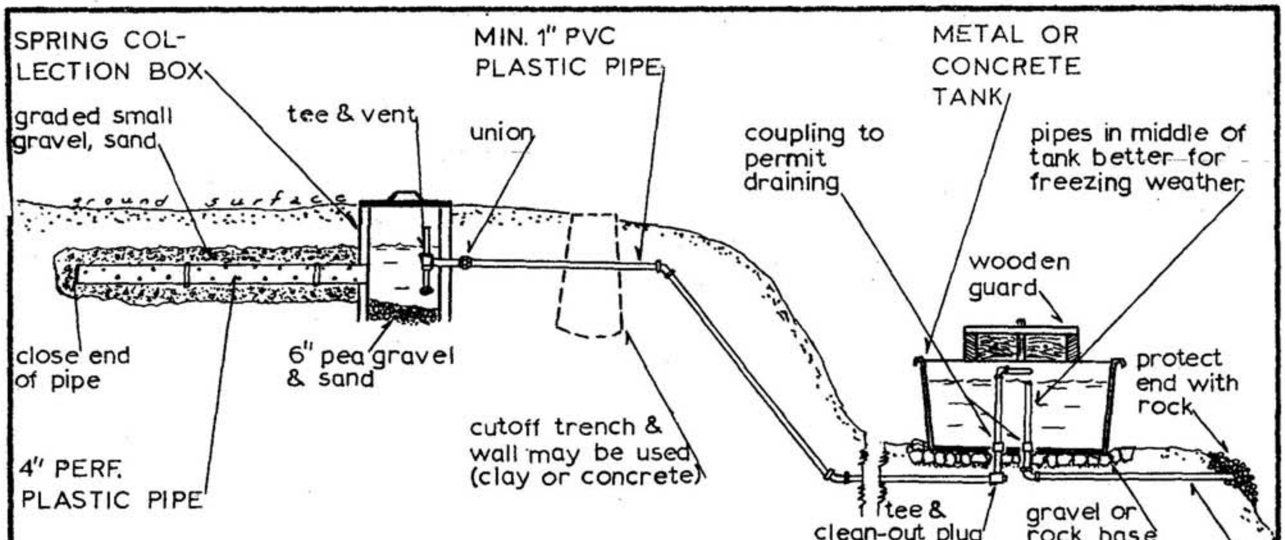
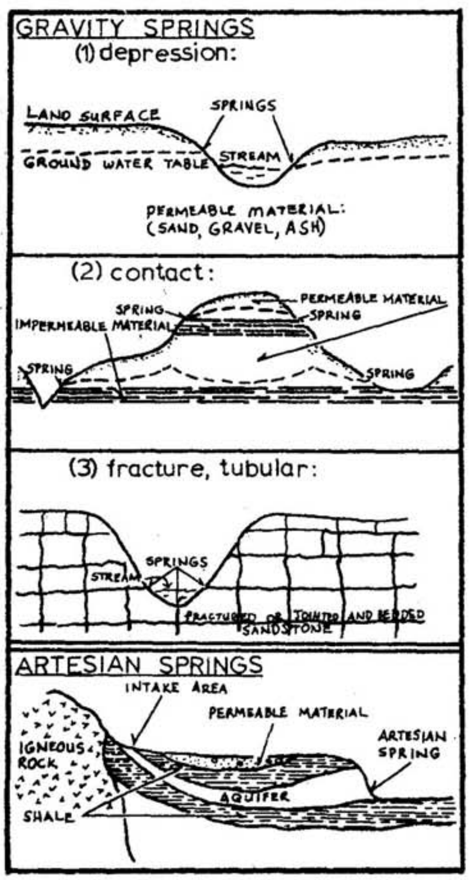


Fig. 2

SIDE VIEW - Typical Spring Development

. . . Further Information . . .

What:



<u>TYPES OF SPRINGS</u>. Geologically, there are two main types of springs - gravity and artesian. Gravity springs are formed by the outcrop of water flowing under the action of gravity. There are three principal classes of gravity springs: 1) Depression springs; 2) Perched or contact springs; and 3) Fracture and tubular springs. A <u>depression spring</u> is formed when the land surface intercepts the ground water table in permeable strata. This type of spring is extremely sensitive to seasonal precipitation and may be intermittent. A <u>perched or contact spring</u> is caused when downward percolation of water is restricted and deflected to the land surface by relatively impervious strata. The outcrop of a perched water table forms a contact spring. Contact springs tend to be more permanent in nature than the depression type. <u>Fracture and tubular springs</u> emerge from impermeable rock through fractures, joints, bedding planes, and solution tunnels. Dependability of supply is also better than depression springs.

<u>Artesian springs</u> result from the water entering the water-bearing strata from a higher elevation. It is channeled downward between two impervious layers; outflowing occurs under some pressure at the ground surface.