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LAKE STATES FOREST EXPERIMENT STATION • U. S. DEPARTMENT OF AGRICULTURE

Flow Characteristics of Two Types of Springs in Southwestern Wisconsin[1]

Springflow in southwestern Wisconsin is of great interest because it has a stabilizing effect on streamflow. Permanent springs may furnish a supply of clear, cool water of special importance in trout streams and ponds. Throughout the area, springs are widely used as a source of water for livestock.

Streamflow records from Coon Creek show that, for the period April 1934 to March 1939, about three-fourths of the total flow was in the form of ground water discharge.[2] Springflow is ground water discharge. Until recently, little information was available concerning the behavior of flow from individual springs in this area.

[1] *Reported from the Station's field unit at La Crosse, Wis., where research is conducted in cooperation with the Wisconsin Conservation Department.*

[2] *Unpublished data in the files of the Lake States Forest Experiment Station.*

More than a dozen springs can be found on the Coulee Experimental Forest, an area of approximately 2,800 acres representative of much of the Driftless Area. The springs are of two distinct types and have been termed "lower" and "upper" in relation to their approximate elevational locations of 900 and 1,000 feet above sea level. Both types may be classified as gravity contact springs. The "lower" springs are near the Ironton-Goodenough contact within the Franconia formation in the geologic structure; the "upper" springs are in the Trempealeau formation at the contact of the Jordan sandstone and the Lodi siltstones.

Besides a difference in elevation, the springs differ in topographic position. The upper springs appear in natural channels, while the lower springs issue from sides of

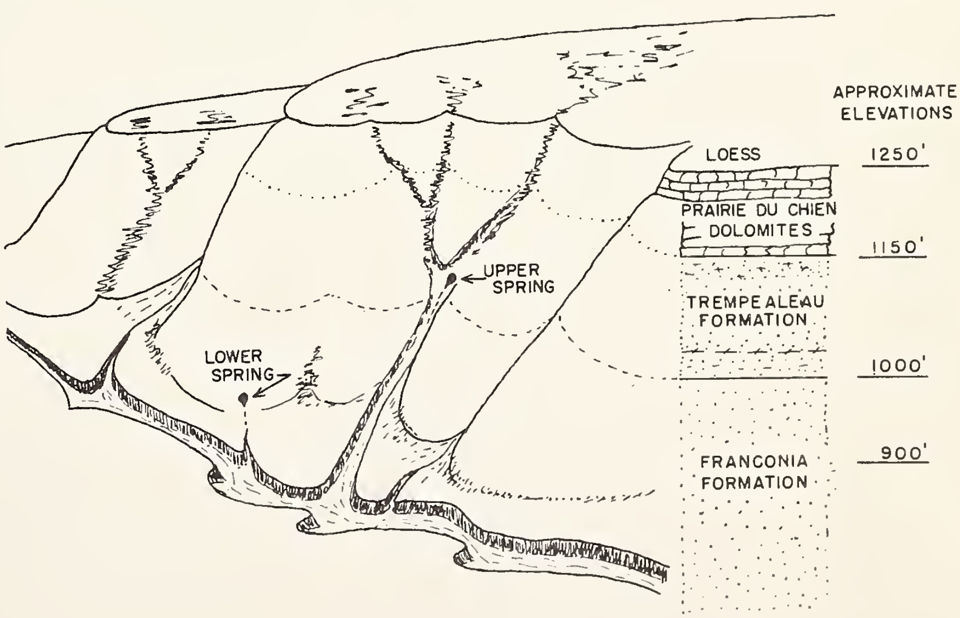

FIGURE 1. — Schematic diagram showing typical land forms on the Coulee Experimental Forest. Locations of "upper" and "lower" springs are shown in relation to topography, geology, and to each other.

hills or from points of secondary ridges (fig. 1).

Three springs of each type were tested for pH, alkalinity, total hardness, calcium hardness, manganese, sulfate ion, and total iron. A difference in total hardness was expected because the upper springs appear nearer the dolomitic caprock than do the lower springs. However, no large differences were found in chemical quality of water.

Perhaps the most striking and important difference between the two types of springs is in their annual discharge pattern. Three springs of each type are being measured. Records collected over a 3-year period indicate that discharge from the upper springs was relatively constant, with little change throughout the year. During the same period, flow from the lower springs fluctuated widely by years, seasons, months, and even days, in relation to climatic variables (fig. 2). The discharge from lower springs has been observed to range from near zero in late winter to over 200 gallons per minute during early spring.

The reasons for the striking differences in flow characteristics between these two types of springs are under investigation. Although both types of springs are usually less than a half mile apart and subject to the same precipitation and climatic variables, the factors responsible for their difference in behavior are unknown. Further investigation will help determine whether manipulation of vegetative cover can modify the contribution of these two types of springs to the total water resources of the area.

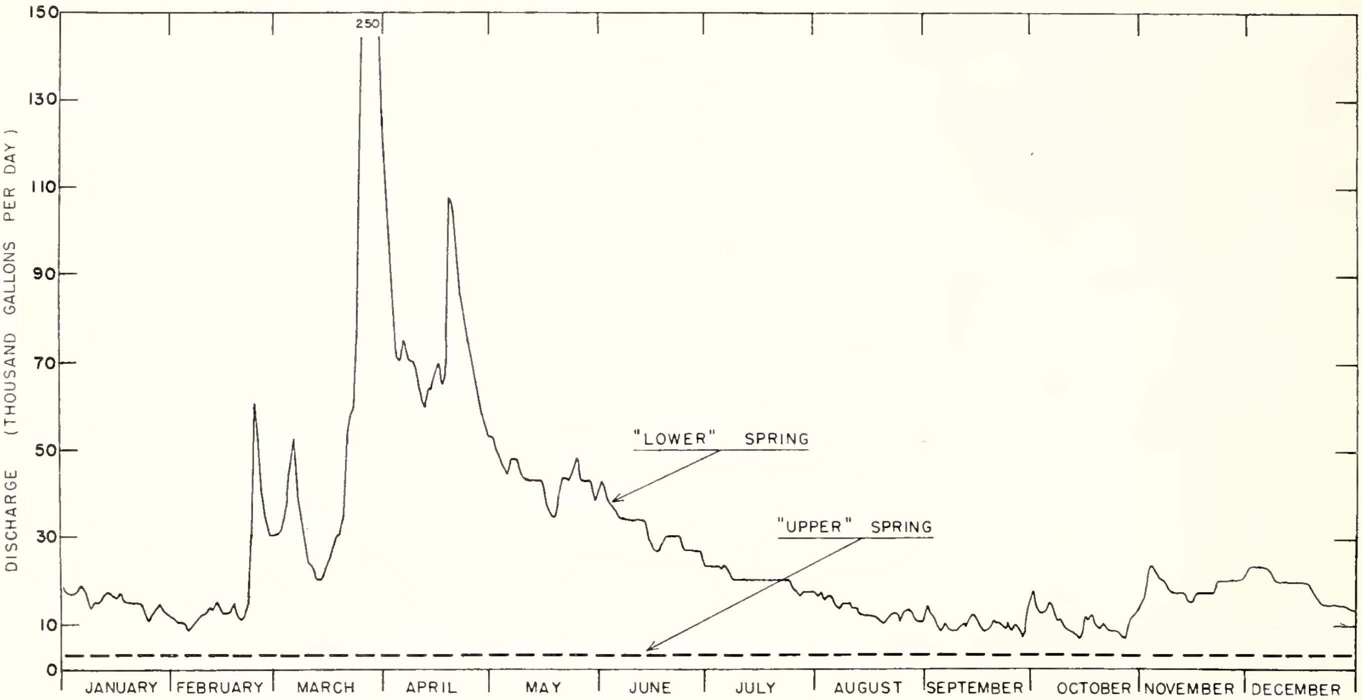

FIGURE 2. — Hydrograph of daily discharge for an upper and a lower spring on the Coulee Experimental Forest, 1961.

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