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A STUDY ON EFFECTS OF INTERMITTENTLY FLOODED AREAS ON GROUND WATER SUPPLIES

U.S. CENTRAL GREAT PLAINS FIELD STATION AKRON, COLORADO

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Numerous small potholes, lagoons, stream bottoms and open reservoirs are periodically subjected to flooding from storm runoff from upland watersheds. In these locations, part of the runoff received is at times excess to crop needs and lost to deep seepage or evaporation. Unknown is the effect of intermittent flooding on the underlying ground water reservoir.

A study was initiated at the Central Great Plains Field Station in an effort to evaluate any possible effects of intermittently flooded areas on the ground water regime. This report summarizes some of the preliminary results of the study.

A truck-mounted, hollow-stem power auger owned and operated by the U. S. Geological Survey, Ground Water Division from Denver, Colorado, was used to drill 16 test holes to bedrock. Three of the test holes were located in stream bottoms, 4 in leveled areas receiving runoff and 9 on drainage divides or unleveled areas. Core samples were collected at selected intervals from 14 of the 16 test holes to study the soil formation and geology of the area. All test holes were cased with 1½-inch steel conduit equipped with sandpoints at the bottom. These wells are used to periodically measure the ground water levels and water content of the soil profile to depth of the water table.

The log data collected from the test holes suggest that 3 geologic formations were encountered: Peorian loess, Ogallala and Chadron. The loess is a massive yellowish-brown silt which varied in thickness from 0.5 to 17.5 feet in 16 of the test holes drilled.

Underlying the loess was the Ogallala formation which contains intervals of impermeable water-bearing sand and gravel and other intervals of impermeable cemented sand and gravel (Caliche). The thickness of the Ogallala varied from 45.5 to more than 86 feet.

At the base of the Ogallala which varied from 46.0 to more than 90 feet below the ground surface lies the Chadron formation. It was usually identified by the mottled red and green or light greenish gray dense clay observed from cores sampled from the formation. This dense clay is impermeable and would appear to limit further downward movement of any free water through the Chadron formation.

All the ground water was encountered at the base of the Ogallala formation. The saturated thickness of the aquifer varied from 5.2 to 29.2 feet for an average thickness of 17.7 feet in 15 test holes. As of July 3, 1969, upon completion of the drilling, the depth of water in 15 wells varied from 26.7 feet in the creek bottom to 77.1 feet on a drainage divide. Average water table was 56.1 feet below ground surface.

Slope of the water is about 10 feet per mile in a northerly direction at the station. Water levels were measured around the first of each month since installation. The water levels remained static to December 1, 1969. During the winter months to March 2, 1970 the average water level rose about 0.3 foot and as of May 5 had dropped an average of 0.2 foot in 15 wells. During this period no major flooding had occurred.

The soil moisture in the profile above the water table was measured in July, September, November of 1969 and again in March 1970. With the exception of the top 5 feet in the profile, the water content had not changed between any sampling date. However, differences were noted in moisture content on different locations. The soil profile above the water table in unleveled sites was drier and less variable than that in leveled areas which have been flooded in the past.

This study will be continued over the next 5 years. Both water tables and soil moisture content will be measured particularly following flood periods. If a rise of ground water levels has been noted in leveled areas subjected to flooding, recharge to the ground water aquifer can be suspected. A more detailed study will then be initiated to determine whether the suspected recharge was due to vertical or lateral inflow to the area. The results of this study should indicate whether or not it would be beneficial to develop and utilize man-made reservoirs for ground water recharge.

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