

MISSISSIPPI
STATE GEOLOGICAL SURVEY

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WATER SOURCES

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Water Sources

In the search for water during drought, the greatest help comes from a consideration of the fundamental principles of geology--a study of the common springs so excellently illustrated in the Holly Springs area and a study of the ground water table likewise excellently illustrated in that area.

When water falls upon the earth as precipitation (rain), a part of it evaporates as ascending water vapor, a part of it runs off as surface water, and a part of it sinks into the ground as ground water. The amount that follows each of these three routes depends on a number of factors. The drier the atmosphere, the more will evaporate and ascend as water vapor. The tighter the soil, the steeper the slope, and the more barren the ground of vegetation, the more will run off as surface water. The more porous the ground, the gentler the slope, and the more retardation to flow by grass and forest, the greater the amount that sinks into the ground to become ground water.

In the formation of springs, the ground water continues its downward course until it reaches some clayey impervious layer on which it collects and along which it flows until it reaches a place where the surface cuts across both the porous sand aquifer and the underlying impervious layer. At such surface intersections the water flows out as common springs, abundant and excellency developed in the Holly Springs area.

The ground water table, the underground surface beneath which the rocks are saturated, fluctuates with the amount of precipitation. In prolonged periods of heavy rainfall it may rise to the surface. In times of drought (dryness) it descends deeper and deeper beneath the surface--hence the difficulty of predicting its position.

The ground water table is not necessarily a level surface; in fact, it varies with the surface of the ground, being somewhat higher under hills and ridges and somewhat lower under the valleys. In short, the water table conforms to the land surface, but not fully.

Streams depend for water not only on precipitation, but on the ground water that seeps into their channels from the sides. Accordingly, in times of drought, all streams without headwater lake sources depend wholly on ground water seepage into their channels. Accordingly, too, a stream that has carved its channel only into the wet weather water table, goes dry with the descent of the water table in dry weather. It is an intermittent stream. On the other hand a stream that has cut its channel into the water table of dry weather flows permanently, and is therefore a permanent stream.

The present flowing streams in the Holly Springs and adjoining areas derive much of their water from headwater springs and some of it from ground water beneath the water table.

The Helicopter investigation, fanning out in all directions from the Holly Springs area, included Grays Creek system in Benton County north to Wolf River and the Tennessee State line; Wolf River through Benton County to the Tippah County line and across it; Muddy Creek through Tippah County into Tennessee; Tippah Creek through Tippah County and Benton County into Marshall County and down the Little Tallahatchie River; up Puskus Creek to its source in Lafayette County.

The next Helicopter flight was along the upland divide between the Tallahatchie River and the Yocona River in Lafayette County; thence on to Pontotoc in Pontotoc County and Tupelo in Lee County; thence a double back to Lafayette County and down the left side of the Yocona River to the Oxford Airport, six miles south of the City.

Next the area of flight was north from Oxford through Abbeville, Lafayette County; thence northwest to the headwaters of Pigeon Roost Creek; thence west down Pigeon Roost Creek through Marshall County; thence into Tate County; thence across the corner of Tate County into southeastern DeSoto County; thence northwest into the Coldwater River valley; thence up the Coldwater River to the junction of the river and U. S. Highway 78, near Byhalia; thence up the highway to Miller Station; thence across country west to Camp Creek; thence south down Camp Creek to the Coldwater River, all in DeSoto County; thence down the Coldwater River to Coldwater City; thence southeast and east up Mickahala Creek and up James Wolf Creek to its source in Tate County; thence southeast across Tallahatchie Reservoir, and up Toby Tubby Creek to Oxford in Lafayette County.

The extensive aerial reconnaissance survey showed that many streams, in fact most streams, trending away from the Holly Springs source area had no water or only a trickle from one channel bottom pool to another channel bottom pool--in fact no water whatsoever for irrigation.

The reconnaissance survey revealed the fact that valley-flat wells would have to penetrate deeper than the bottom of stream channels. The survey likewise indicated the approximate depth to the ground water table in wells in the upland. These facts are discernible from the surface by auto and helicopter observations. In fact never can there be a better time for the local citizen to determine for himself the depth to well water supply.

Next comes the problem of deep well supply, the study of which the State Geological Survey hopes to undertake at once--but here the search will be by Failing Drill penetration rather than by Kaman Helicopter scanning. But some facts are known to the geologist in advance. In this area much of the deep water replenishment must come from local rainfall which will supply the shallow wells first. A smaller part of the replenishment may come from adjacent areas, but strata in the Holly Springs-Woodson Ridge area lie nearly horizontal, a condition not conducive to rapid replenishment. In short, it would seem that the deep water withdrawal over the whole area cannot exceed that one-in-three parts of the 50 inches of rainfall.

The actual amount of flow, "discharge," was measured on October 13, 14, and 15, by the State Geological Survey and the U. S. Geological Survey cooperating.

Of the small streams, the flow of Chewalla Creek was perhaps the most remarkable--14,400 gallons per minute (g.p.m.) near its source; 25,200 g.p.m., near its mouth. Little Spring Creek had a flow of 17,510 g.p.m. near its mouth; Big Spring Creek, 398 g.p.m. at Highway 78 near its source. The waters of these three streams eventually find their way into the Tallahatchie.

Above the mouths of these creeks, Tippah Creek is the principal stream. Above Chewalla's mouth its flow was 29,810 gallons per minute; farther up at Highway 5, it was 8,890 g.p.m.; near its source 494 g.p.m.

Farther east in Tippah County near the Tennessee line Muddy Creek had a flow of 543 gallons per minute. Toward the north in Benton County, Gray Creek near its confluence with Wolf River at the Tennessee line had a flow of 3,190 g.p.m. Mid Wolf River in Benton County was flowing 6,601 g.p.m.; farther up stream nearer the Tippah County line, 727 g.p.m.

The nearly level Coldwater River at State Highway 7 in Marshall County had a flow of only 380 g.p.m.; at U. S. Highway 78 in DeSoto County, 18,700 g.p.m. To the south in Lafayette County Hurricane Creek at Highway 7 was flowing 4,620 g.p.m.

These measurements reveal the maximum amount of water that can be withdrawn from these streams or pumped from valley wells during drought of three consecutive years. In fact the withdrawal of these total amounts would temporarily exhaust both streams and wells.

In times of normal rainfall, the amount available for all purposes,--domestic well, stock pool, and irrigation--will be far greater, and will have to be determined during such normal periods of rainfall. During excessive rainfall water for irrigation will not be needed; in fact the problem will be to get rid of it. Such great variation in rainfall makes the water problems difficult in Mississippi--problems that seldom rise in the West where water is always needed.

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A report on the third of a series of Water investigations.