

A CONTRAST IN WATER RESOURCE DEVELOPMENT AND SETTLEMENT PATTERNS: BLACK PRAIRIE AND NORTH CENTRAL HILLS REGIONS OF MISSISSIPPI

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INTRODUCTION

The type of water source available to support life is strongly connected to human's use of the landscape. Settlement patterns and densities are related to the accessibility of a stable and potable water resource to support domestic use. As technologies for providing more stable and higher quality water sources have emerged through time, populations and settlement distributions have grown and changed. Earliest settlements used primarily surface water, with wells generally not becoming commonplace until the late 1800s. The use of groundwater, with the exception of spring water, was unusual throughout most of the nineteenth century until pollution and disease in surface waters forced people to develop groundwater (Kazmann, 1972).

An investigation into water resources of the Black Prairie (Prairie) and North Central Hills (Hills) regions of Mississippi showed that the geology of the Prairie region exerts a stronger control on the presence of sources of water for human use than in the nearby Hills region, which is not underlain by chalk. Figure 1 shows the relationship between the controlling geology and surface water features of the Prairie region. It can be seen that perennial streams do not exist unless their source is outside the Prairie. The control of the chalk on the course of the Tombigbee River on the eastern edge of the Prairie is also evident. In contrast, Figure 2 shows the ubiquitous water features in the sandy terrain of the Hills region. The development of water resources in both the regions appears to fall into several discrete time categories, each associated with identifiable technological innovations. Each of the categories of technology provided certain constraints or opportunities for settlement in the regions. Each progressively higher level of technology allowed greater opportunity for a less limiting arrangement of house sites and settlement distribution. The purpose of this study is to document the different levels of water resource technology that were used to support humans as they occupied these two regions from prehistoric times to the present.

BACKGROUND INFORMATION AND METHOD OF ANALYSIS

Permanent prehistoric settlements are found in the Prairie only along permanent streams which flow across the region, such as Tibbee Creek and the Noxubee River (Rafferty, 2001). Other permanent sites are found on the periphery of the region where the geology results in springs or seeps. Notable exceptions are found at Chickasaw sites near present-day Tupelo where pits dug into the chalk at the surface were used to collect rainwater, and sites found near terrace deposits on top of the chalk, which may have provided seeps. The lack of water available to the earliest inhabitants and settlers in the Prairie region is indicated by a virtual lack of water-derived place names. By contrast, the greater relative availability of water in the Hills region is indicated by place names such as Clear Springs, Double Springs, Slate Springs, and Black Wells. It is also illuminating to note that two counties in the study area take their names from Choctaw Indian words relating to water resources. For example, "Oktibbeha" is derived from a word that means "pure water", whereas "Noxubee" comes from a word meaning "stinking water" (Mississippi Department of Transportation, 1997)! This illustrates the point that water sources were limiting to habitation patterns early in the settlement of this region, but at the same time provided opportunities for humans.

Advancing technology of water supply development allowed for expansion of the populace. Four main stages of development are noted. First was the utilization of perennial streams, natural springs, and dug collection pits. This was followed by the construction of impoundments and dug wells and cisterns as a second stage. The availability of equipment to access greater depths than dug wells provided the third major stage of development—hand-bored wells, which developed groundwater beneath the chalk in the Prairie region, and mechanically augered wells which reached depths greater than dug wells in the Hills region. The fourth stage identified is that of the rotary and fluid

system for drilled wells. Drilling technology and changes in supply demands resulted in these different types of bored and drilled wells. When the groundwater was first developed by drilled wells, it often flowed under artesian conditions. Later, when artesian flow conditions no longer prevailed, various methods of lift were employed to bring the water to the surface. Each of the newer technologies increasingly removed constraints of location, resulting in greater choice of home sites not limited by water sources.

STREAMS, SPRINGS, AND COLLECTION PITS

Springs and Collection Pits in the Prairie Region

Native Americans utilized springs as water sources, and their camping sites were thus often geographically restricted. In the northern part of the Prairie region the Chickasaw dug pits in the chalk to collect water (figure 3). DeRichardville, being held captive by the Chickasaw in the 1730s, reported "There is no stream in these villages, they have only some springs or they make pits which furnish water." When Europeans began to settle the Prairie region, they also initially utilized springs along the Prairie's edge as their water source. Nance, visiting the Choctaw in 1832, reported "But the disadvantage is there is no water.I rode from morning until night until I got a drop, and then not good."

Streams and Springs in the Hills Region

The first European settlers in the Hills region homesteaded near the same springs the Native Indians had used near the Natchez Trace. Figure 4 shows a spring at a location known as the Edwards homesite, one of the first European homesites in the region. This homestead first showed up on the 1837 property rolls in Choctaw County, and is representative of the first level of technology for acquiring water for domestic use which began in prehistoric times and is still in use today in a few cases. The greater occurrence of naturally available water sources for early human habitation in the Hills region is verified by a 1916 article in the Jackson Daily News about the town of Ackerman which stated "Our water supply comes from springs high up on the rock hillside and is as clear as crystal; consequently, no people in any community have better health than our citizens." An article in the Choctaw Plain Dealer in 1949 similarly gave tribute to the water resources by declaring "This area is covered by the greatest of hardwood forests, fed by swift creeks and rushing spring branch water."

CONSTRUCTED IMPOUNDMENTS, DUG WELLS, AND CISTERNS

Prairie Region Impoundments and Cisterns

Springs provided a finite water supply and geographically restricted settlement to the periphery of the Prairie region, so additional growth in population from European settlement required a different method of obtaining fresh water. The first new methods were constructed impoundments and dug cisterns. Simple levees were constructed to impound surface runoff, creating small pools. Measurements made in one such impoundment found on the western edge of the Prairie region show a potential maximum holding capacity of approximately 9000 gallons. Even an impoundment of this size would dry up during extended periods of drought. Additionally, cisterns were dug into the chalk to catch and hold water. Gavin (1843) noted that: "Some of the planters dig cisterns in the rock and catch rain water in the winter for drinking and culinary purposes in the summer and dry seasons." Figure 5a is a sketch showing construction details of these dug cisterns, called "bottle" cisterns. Note that the neck of the cistern from the surface down to the top of the chalk is lined with brick, allowing water to seep through the soil into the cistern, but that there was no collection of groundwater. The remainder of the cistern is a hand-dug cavity in the chalk. The relatively impervious chalk would hold any water in the cavity. The geometry of one particular cistern found in Oktibbeha County suggests a maximum holding capacity of about 4000 gallons. Based on the water level in the cistern at the time it was investigated, the cistern was holding about 1000 gallons.

Hills Region Dug Wells and Cisterns

In the Hills region, hand-dug wells have been excavated since the late 1800s even until relatively recent years. They achieved depths of up to about 36 feet. Earlier wells were lined with rock, followed in time by brick, and finally, in more recent years, with concrete cylinders. Dug wells are usually 30 to 36 inches in diameter as the one shown in Figure 5b, and are open at the base to allow groundwater to seep into the well. Cisterns were bricked and enclosed at the base to hold rain water runoff from rooftops of houses, not groundwater, as opposed to dug wells. However, cisterns are often similar in appearance to dug wells.

HAND BORED AND MECHANICALLY AUGERED WELLS

Hand Bored Wells in the Prairie Region

Hand bored wells were found in the Prairie region beginning in the 1840s (Gavin 1843), a hundred years earlier than in the adjacent Hills region, and were still being constructed as late as the turn of the century. Initially these wells were found at the edges of the Prairie or in terrace deposits on the Prairie itself. These terraces are associated only with the major streams of the region, such as Tibbee Creek and Noxubee River. Stephenson et al. (1928) reported “deep wells were sunk to the water-bearing sands of the Eutaw formation in Noxubee County as early as 1852,” even though Wailes, in 1854, reported no wells drilled through the chalk, and no wells out on the Black Prairie. However, Wailes mapped more than 30 wells east of the Tombigbee River in Lowndes County (Wailes, 1854). Three years later, Harper (1857) reported artesian wells through the chalk up to 300’ in depth at some locations, and borings of up to 600’ depth at other locations that did not penetrate the chalk. He stated that “the country where the limestone group crops out is generally not well-watered; and in summer there is a want of water, which is, in many places, supplied by artesian wells; but such wells can only be bored, with perfect success, in Lowndes County and a Part of Oktibbeha County; only there the Cretaceous rocks are not too thick, and the water has fall enough to rise above the surface” (Harper 1857).

Hilgard (1860) reported “borings of 700’ to 1000’ being no uncommon occurrence in S. Chickasaw, E. Oktibbeha, Noxubee, and N.E. Kemper [counties].” He further noted “...the vast importance which the boring of deep, and partly artesian, wells has acquired in this region. Where these have not been obtained, cisterns are in general use” (Hilgard, 1860). Figure 6 depicts equipment and techniques for hand-boring wells through the chalk on the Prairie and elsewhere. It is notable that deep, bored wells were being developed in this region nearly 100 years earlier than they were being developed outside the Prairie (Schmitz et al. 1999).

These hand-bored wells initially exhibited flowing artesian conditions. With continued development of the resource however, artesian pressure was not always sufficient to produce flowing wells. Initially this was because of increasing depths of wells; later it was because increased use resulted in lower artesian pressure in the aquifer. Various methods of lift then had to be employed to bring the water to the surface from beneath the chalk. Hand pumps were first used, followed by mechanical methods such as windmills and air and gas lift techniques (Stephenson et al. 1928). Logan (1903) commented that “the cost of furnishing a pasture with well, pump, and windmill can not greatly exceed the cost of building and keeping in repair the ponds or pools necessary to supply the required water.” Stephenson et al. (1928) reported windmills in use in the Black Prairie on wells completed in 1901 and 1903, but lack of dependable winds precluded the widespread use of windmills in this region.

Augered Wells in the Hills Region

Just after World War II military surplus equipment allowed wells to be bored or augered to greater depths in the Hills region. Augered wells were commonly found in the Hills region where they replaced shallow, dug wells or spring sources, which were more susceptible to pollution and forms of water-borne disease. Eight to nine inch concrete culverts were commonly used to case the hole. Augered wells in this region reached depths to 50 -60 feet normally, but several were in excess of 100 ft. Water was obtained with a narrow bailer and crank. Augered wells were not developed in the Prairie region because the mechanical augers would not penetrate the thick chalk.

ROTARY DRILLED WELLS IN BOTH REGIONS

The final technological advancement, which occurred early in the 1900s in the Prairie region, allowed for easier and more cost-effective access to water by drilling through the chalk with an efficient system using a mechanized rotary drilling rig and drilling fluid for lubrication. Whereas earlier and more costly hand bored wells primarily were constructed in municipalities and on large plantations, rotary drilled wells were being constructed at private residences as early as the 1920s (Mike Echols, personal communication 2000). The number of wells being drilled for private residences in the Prairie region increased particularly after World War II, and proliferated in the late 1950s and into the 1960s. These wells were drilled to depths of several hundred to over a thousand feet. The casings in these drilled wells were commonly 2 inch diameter galvanized pipe, and for the first time electricity was used to power a rod-type, above-ground pump. Because of this new technology, essentially any location in the Prairie could now have its own water source as long as electricity was available.

Similarly, in the Hills region technological advancements also allowed for even deeper access to fresh water by drilling with the rotary and fluid system. Drilled wells for domestic supplies in this region also proliferated in the late 1950s and into the 1960s. The depths of the drilled wells in the Hills region, in contrast to the depths in the Prairie region, were up to a maximum of about 400 feet, although most were from 100 feet to 300 feet in depth. Some of these wells are still in use today.

With this last technological advancement in well drilling, essentially any location in both regions could have its own fresh-water source as long as electricity was available. Pumps were also added to some springs, dug wells, and augered wells to provide a more convenient water supply, some of which are also still in use today in the Hills region.

Initial high costs of the deeper wells and the inconvenience of continuous maintenance of private wells at residences led to early development of water associations in the Prairie region. Rural water associations were created in both regions to provide almost everyone with dependable and good quality water via a water line, negating individual well maintenance and water treatment. Among the first water associations in the Prairie region was what is today known as Herman Echols Memorial Water Association, Inc., the first well for which was drilled in 1959. Most water associations in the Prairie region were in place by the late 1970s, nearly 20 years ahead of such development in the Hills region where water was always more readily available to support the expansion of settlement (Schmitz et al., 1999). Depths of these public supply wells were several hundred to over 1000 feet in the Prairie region. In contrast, these wells in the Hills region were also deeper than the earlier private wells, yet provided ample water from depths of only a few hundred feet--notably shallower than in the Prairie region. These public wells also used larger diameter ten-inch steel casings with submersible pumps to provide larger amounts of water to a larger and growing population. These associations are the primary source for nearly all water used in the region today, replacing all other sources because of convenience, dependability, and health reasons. The associations' water lines cover nearly all parts of the Prairie and Hills regions, allowing unlimited expansion of house sites and settlement distribution.

SUMMARY AND CONCLUSIONS

It is apparent that the unique geologic setting of the Prairie region has been a controlling influence on settlement patterns there because of its effects on water availability. The early Historic period Chickasaw dug pits in the northern portions of the region, and these served primarily or incidentally as water collection features. Early European settlement (1830s) made use of constructed impoundments and cisterns dug into the chalk for water sources. The first bored wells (1840s), allowing access to groundwater, were in the terraces and along the periphery of the region; the first bored wells actually penetrating the chalk were reported in the 1850s. Mechanized lift methods and rotary drilling techniques were in use by the turn of the century. Cisterns and impoundments, while still in common use in the Hills region, were in limited use on the Prairie by the 1920s, with wells drilled through the chalk to groundwater commonly in use on the Prairie at that time. As electricity became more readily available, private wells drilled through the chalk proliferated in the 1950s-60s, increasing settlement opportunities. Water associations began on the Black Prairie as early as 1959 and were supplying essentially all of the water needs by the late 1970s, making a cost effective and dependable water supply available and allowing settlement almost anywhere in the Prairie region.

In an easily drawn distinction, it is evident that the ubiquitous streams and springs in the Hills region supplied more readily available water for both prehistoric and early European (1830s) occupants. In contrast to the use of dug cisterns in the 1830s in the Prairie region, not until the late 1800s did hand dug wells and cisterns come into common use in the Hills region. The first bored wells in the Hills region were a hundred years behind those in the Prairie. Rotary and fluid drilled wells were not common in the Hills region until about 1960, in contrast to their appearance on the Prairie in the early 1900s. Finally, public water associations did not become the dominant source for water supply in the Hills region until the 1970s, compared to their first appearance in the late 1950s in the Prairie region.

The influence of geology and hydrology on settlement makes the Prairie region distinct from the Hills region. Prehistoric settlement patterns on the Prairie are radically different from those in the Hills (Rafferty 2002; Peacock 1997). Deep bored wells were constructed on the Prairie about 100 years earlier than in the Hills region, and water associations, which are the primary source of water today in both regions, began operating to supply water on the Prairie about 20 years earlier than in the Hills region.

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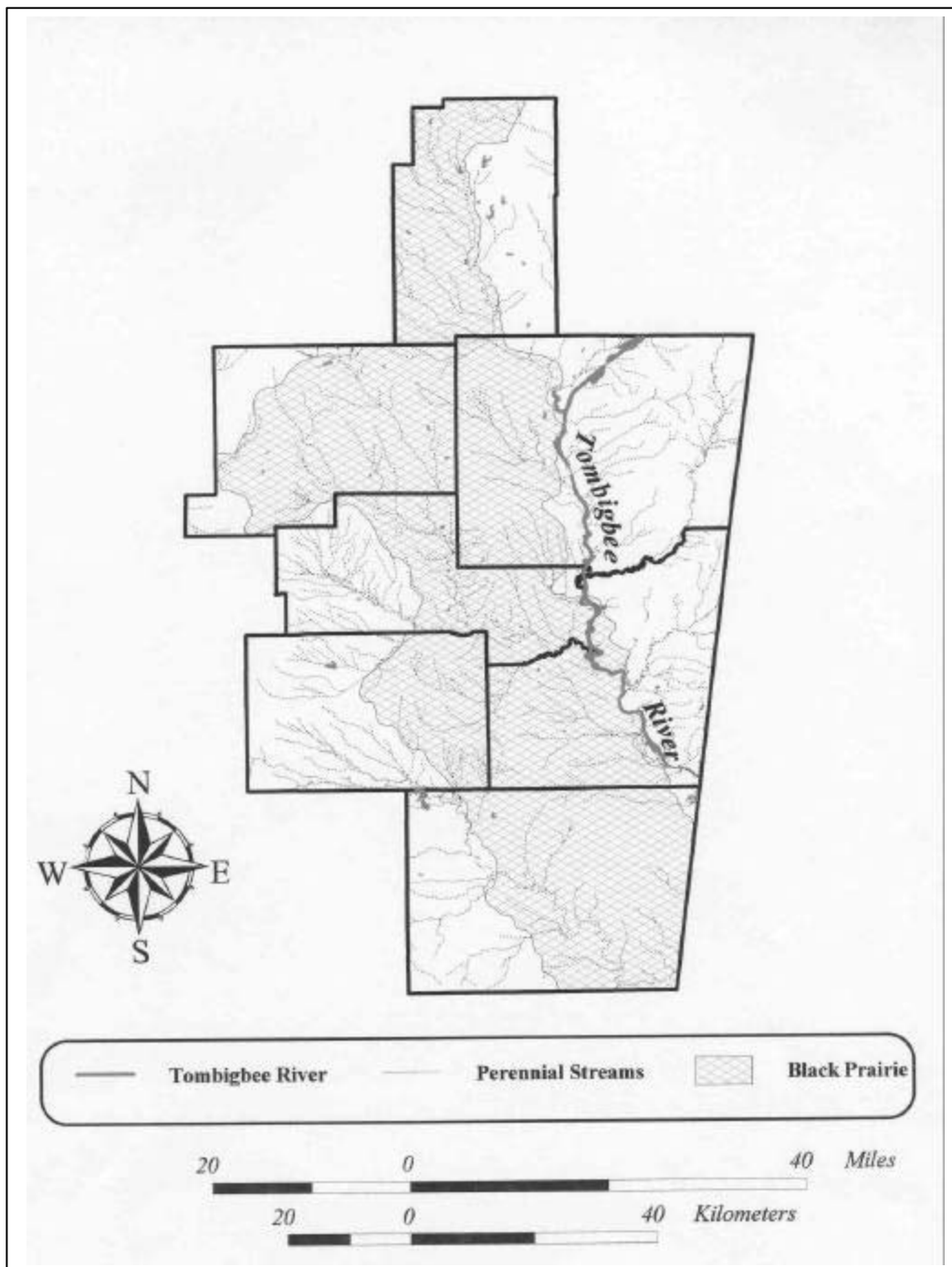


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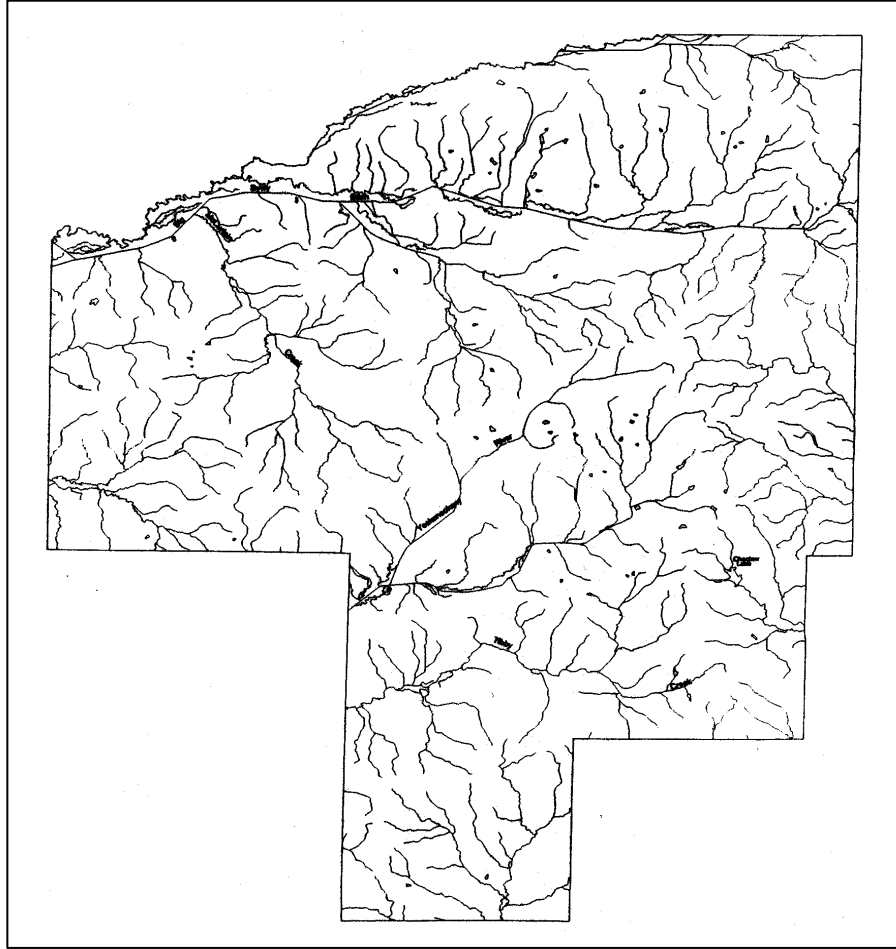


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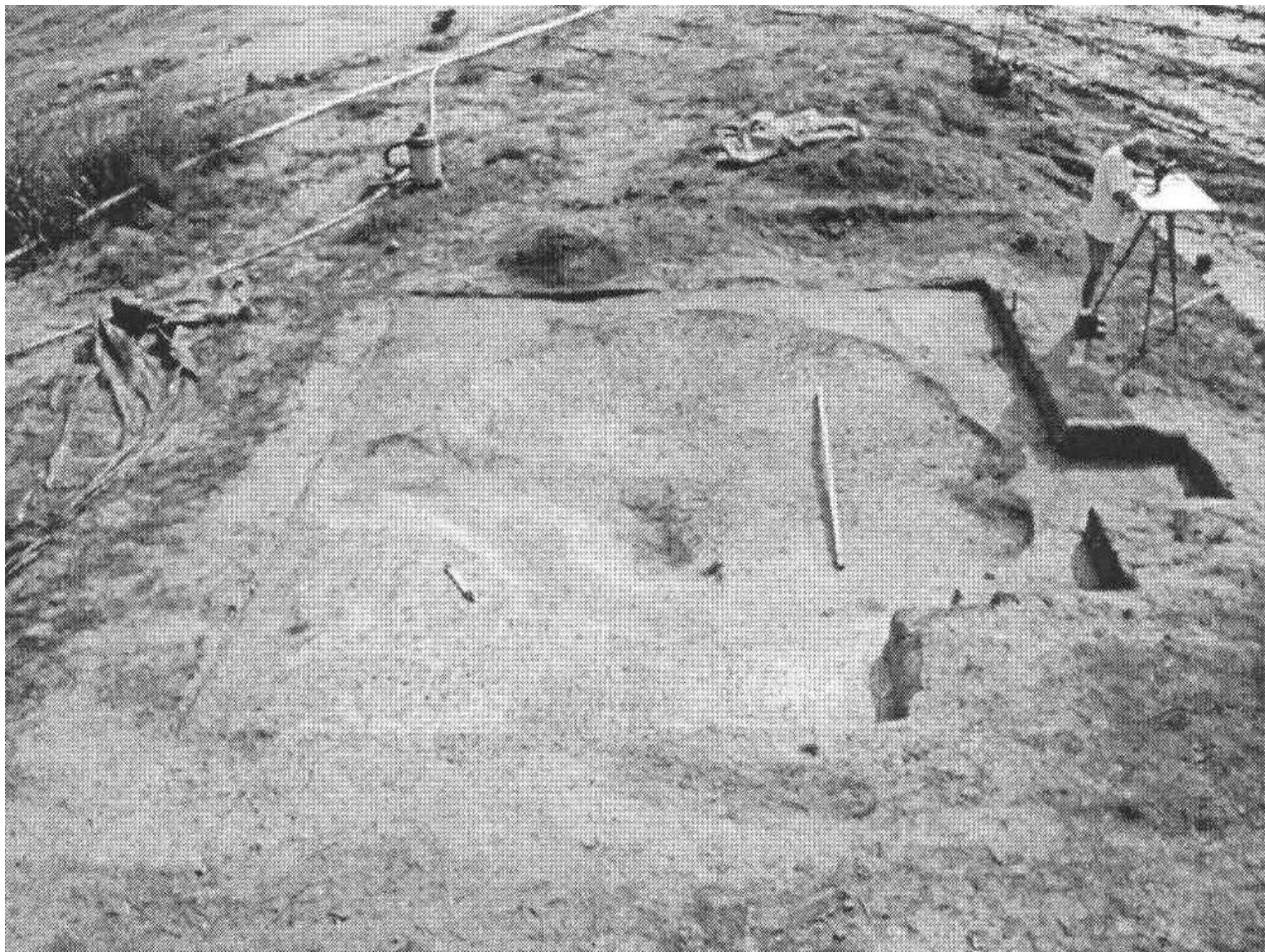
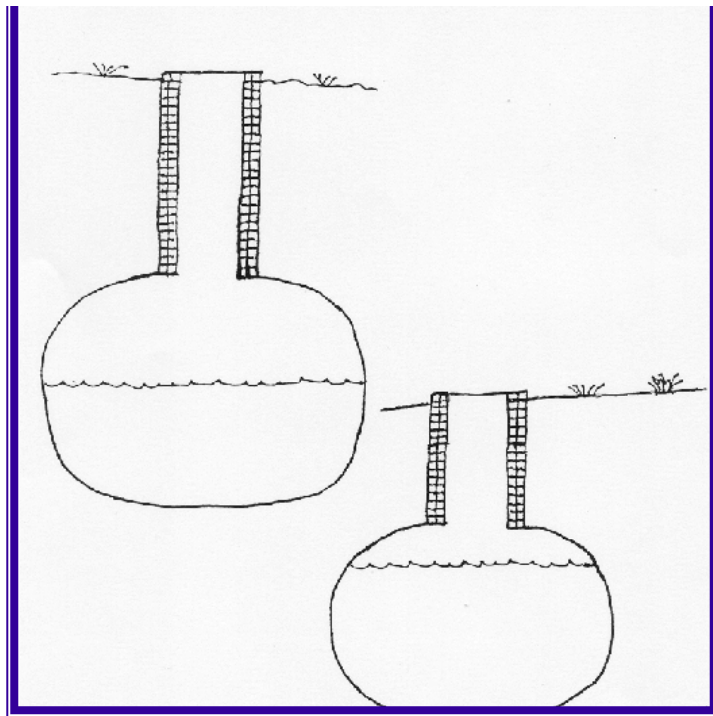


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Figure 4: Spring at Old Edwards Homesite, Choctaw County



(a)



(b)

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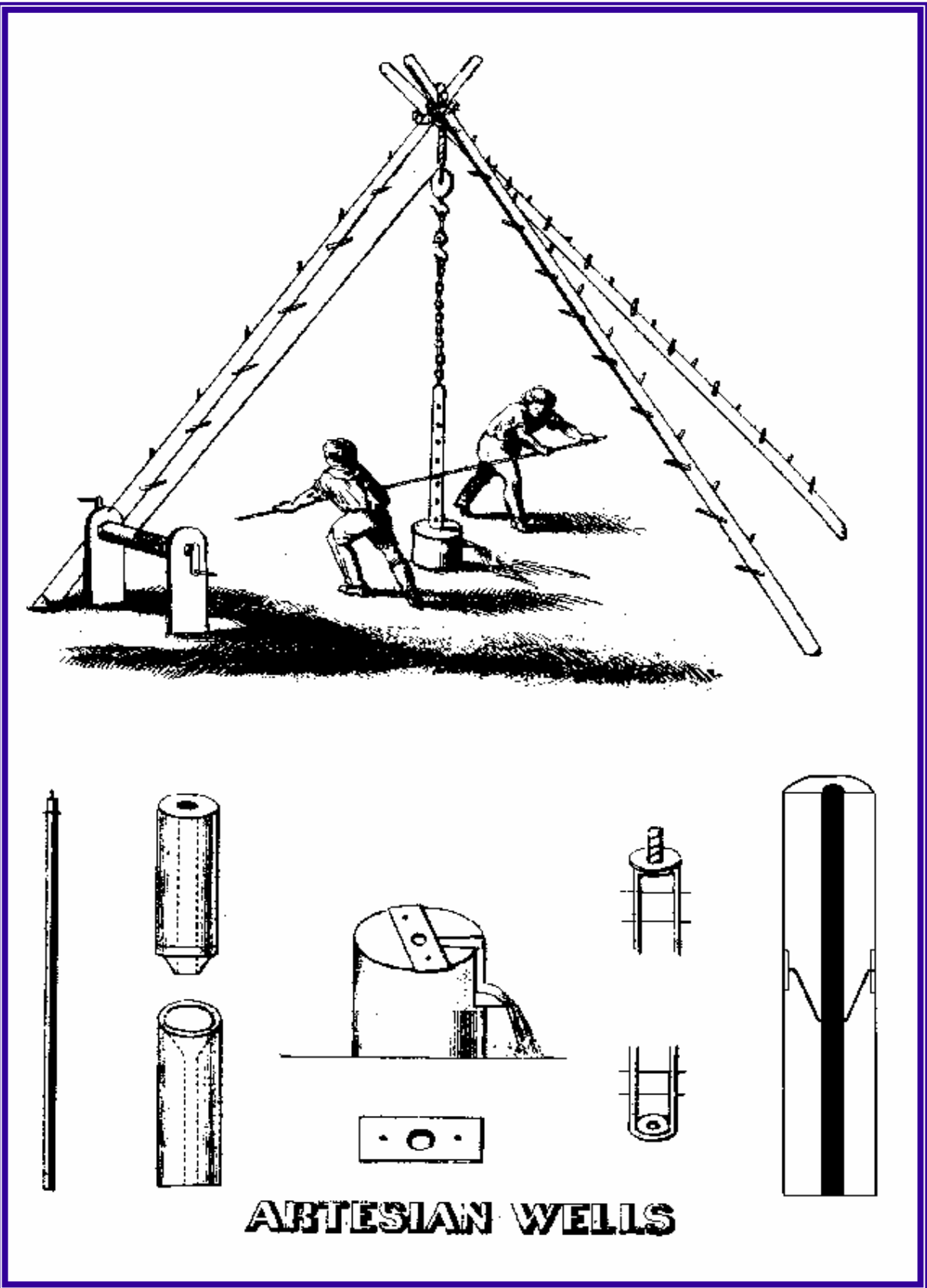


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