Drinking the Waters

National Park Service
U.S. Department of the Interior

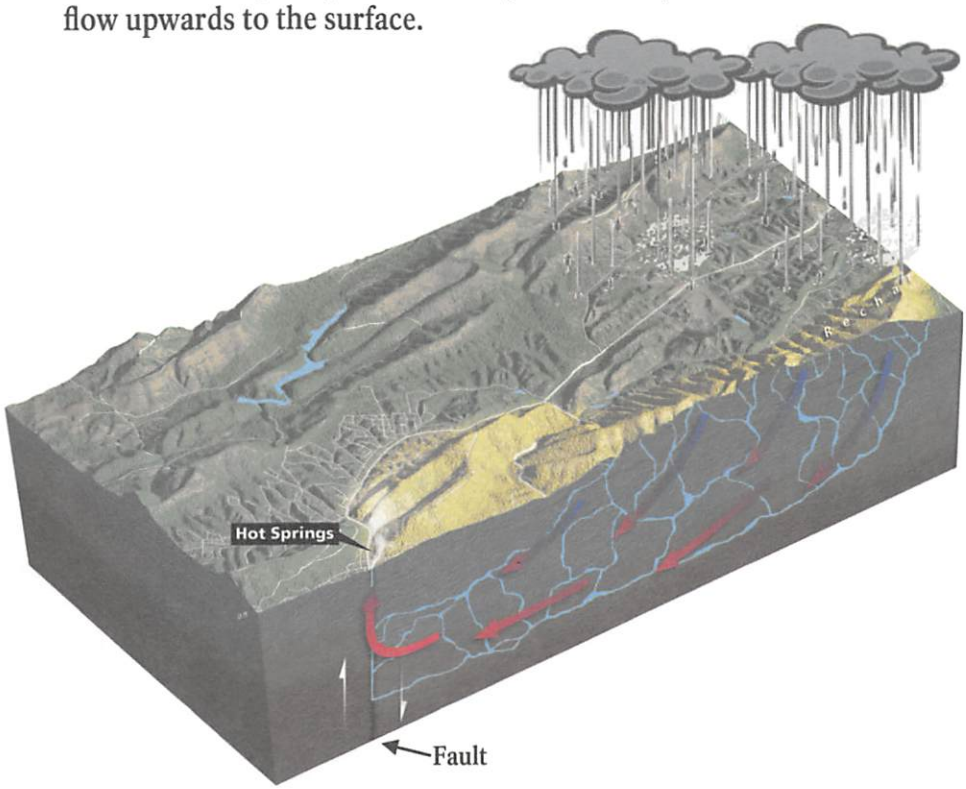
Hot Springs National Park
Arkansas

Hot Springs Reservation was created in 1832, setting aside the unique geothermal features of the area. In 1921, the reservation was re-named Hot Springs National Park, becoming the 18th unit of the National Park Service. Although its name and the natural landscape have changed over time, the mission to protect the thermal waters and surrounding lands for public health, wellness, and enjoyment remains. Hot Springs National Park is one of the few parks that encourages visitors to take some of its primary resource, the water, home with them. Go ahead and, as people used to say during the Golden Age of Bathing, "quaff the elixir!"

Thermal Water Origin

Hot Springs National Park is located in the Ouachita Mountains of central Arkansas. The fracturing, folding, and faulting of rock due to the large forces generated during the uplift of the Ouachita Mountains 300 million years ago created the natural "plumbing" for the park's geothermal features. The thermal waters originate as rain, snow, and ice. The water seeps very slowly into the earth through cracks and fractures to a depth of 6,500 to 8,000 feet. It then flows quickly upward along two major faults and comes to the surface at the base of Hot Springs Mountain. The thermal water flowing from the springs today is around 4,400 years old!

The thermal water reaches a maximum temperature of 150 °F/66 °C at its deepest point. Most of that heat is preserved because the water comes to the surface so quickly—it takes only about 100 years for the water to flow upwards to the surface.



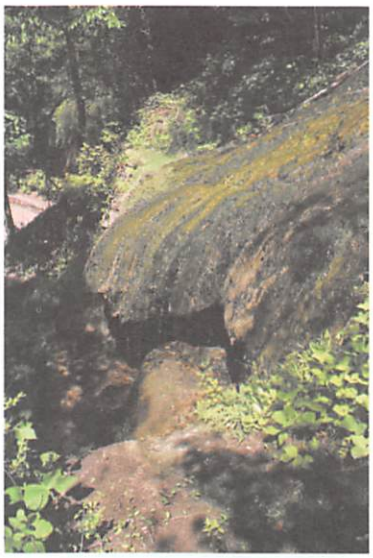
Water Temperature

Vapors from the thermal water

There is no "hotspot" volcanic source of heat in the park. Rather, as the water flows deeper and deeper into the Earth's crust, it is heated by the natural increase in temperature with depth into the Earth, known as the **geothermal gradient**. Although slight differences in temperature exist between individual thermal springs, the thermal water has an average temperature of 143 °F/62 °C. The temperatures have stayed relatively constant throughout time, but seasonal temperature changes do occur.

The thermal water is provided unaltered to the public. Water quality treatments are not required due to its high temperature. Harmful bacteria are not able to survive the extreme temperatures of the springs. However, the thermal springs are home to a variety of harmless **thermophiles**: heat-loving organisms that can live in temperatures greater than 104 °F/40 °C.

Water Quality



Tufa formation at the thermal cascade

The water from the thermal springs is unique due to its relatively low mineral content. The rocks through which the thermal waters flow are made up of only a few parts—mainly **silica** (silicon dioxide), **calcium**, and **bicarbonate** (hydrogen, carbon, and oxygen). Only trace amounts of other dissolved minerals, such as **magnesium**, **potassium**, **sulfate**, **chloride**, **iron**, and **zinc**, are present in the thermal water. The average pH of the hot springs is neutral, at just over 7.

Due to the high amount of bicarbonate and calcium in the thermal water, a mineral called **tufa** forms in many of the springs. As water flows from the springs, carbon dioxide dissolved in the water is released, allowing calcium carbonate ($CaCO_3$), or tufa, to form. At one time, tufa covered the entire hillside of Hot Springs Mountain. However, due to early development, much of the original tufa formations were removed. Tufa formations can still be seen in the park along the Grand Promenade and Bathhouse row. In fact, you can see tufa actively forming in the springs today.

While the major percentage of water forming the hot springs comes from a deep and ancient groundwater source, there is a small contribution from shallower, cold groundwater less than 20 years old. This shallow groundwater mixes with the thermal spring water near the surface. It provides up to 30% of the total spring flow during and after heavy rainfall. This mixing of shallow, cold water with the hot, deep water can reduce the spring temperatures as well as alter their chemical and bacterial properties. Because this shallow groundwater is more easily contaminated from the surface, it is up to all of us to ensure that our actions do not contribute to pollution in the park.

Times of Change

Covered springs along the Grand Promenade

Have you noticed the green metal and concrete containers scattered around the park? You may be surprised to learn that within many of these containers are springs! Water from the springs once seeped out of the ground's surface to flow freely down the hillside. Complex piping and wooden trough structures were erected in the late 1800s to divert the spring water directly to the early bathhouses. The modern containers covering many of the springs were built in the 1930s to protect the water quality. The current underground collection system has been in place since 1974.

Each day, nearly 700,000 gallons of thermal water are collected from 27 springs into a large underground storage tank. From there, the water is distributed to the bathhouses, drinking water fountains, and jug fountains found within and nearby the park. Water from springs which are not part of the collection system and any excess water from the underground storage tank is diverted to Hot Springs Creek. The two cold water springs in the park are part of separate collection systems that supply the Happy Hollow and Whittington Park jug fountains.

Future of the Springs

Although water quality of the thermal and cold water springs are routinely monitored by park service employees, the future of the springs depends on all of us. For example, changing weather patterns could influence the amount of rainwater that enters the flow path of the thermal springs. This could also impact the shallow, cold groundwater component of the system and impact the overall thermal water quality. The shallow groundwater also presents a possible source of nutrient or bacterial contamination to the thermal water.

A comparison of spring flow and rainfall has shown that, in spite of the age of the water, today's weather has a direct effect on the spring flows. Water must enter the flow path to drive the system, and the hot springs are vulnerable to periods of drought and other changing weather patterns. Ongoing research into and awareness of these and other possible impacts to the springs will help protect this unique natural resource for future generations.

Cold Springs

Water jug from 1960

In addition to the many thermal springs within Hot Springs National Park, there are two cold water springs available to the public: Happy Hollow Spring on the southeast slope of North Mountain and Whittington Spring at the base of West Mountain. The average temperature of Happy Hollow Spring is 62 °F/16.7 °C, its average pH is 4.5, and the water is less than 20 years old. The average temperature of Whittington Spring is 66 °F/18.9 °C, its average pH is 7.25, and it is more than 6,000 years old. Water from both cold springs is treated before being released for use at jug fountains.

Drinking the Waters

The National Park Service does not claim the water is curative, but the park does certify that it is safe to drink. Spring water is provided to the public free of charge. There are two cold spring jug fountains and four thermal water jug fountains in and around the park. Thermal water is also available at the Noble Fountain, the Shell Fountain, the Lamar Fountain, and two fountains located on the Grand Promenade.