THE GEOLOGY OF FALLING WATERS STATE RECREATION AREA

FLORIDA DEPARTMENT OF NATURAL RESOURCES

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LEAFLET 16

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by

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Prepared by the
FLORIDA GEOLOGICAL SURVEY
TALLAHASSEE
1992

Cover: Falling Water Sink viewed from above the overlook (FGS photo).

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Falling Waters State Recreation Area aptly derives its name from one of Florida's most interesting geological features. The centerpiece of the park is the 100-feet deep, 20-feet diameter vertical Falling Water Sink, into which a small stream cascades during the wet seasons. The water falls into the sink and disappears underground into a maze of subterranean caverns developed in the 30 million year old limestone which underlies the region. Falling Water Sink owes its existence to a unique and fascinating geologic history.

GEOLOGIC HISTORY

The region surrounding Falling Waters State Recreation Area is underlain by ancient marine limestone. Limestone visible in the park today is comprised largely of the calcium carbonate shells of sea creatures which lived in the shallow seas covering northern Florida between 20 and 30 million years ago. As the animals died, their shells settled to the sea floor, slowly building a thick sequence of limestone. Some of these limestone strata are exposed in the walls of Falling Water Sink.

Over the succeeding millions of years, the sea advanced and retreated many times. During low sea level, when the ancient sea floor was exposed as dry land, erosion and weathering removed portions of the deposited sediments. During periods when sea levels were higher, more sediments, such as limestone, sands and clays, were deposited on top of the older limestone. These, too, were eroded during intervening periods of low sea level. Therefore, only a partial, sporadic record of the last 30

million years of geologic time is represented in the wall of Falling Water Sink.

With the onset of the Pleistocene Epoch ice age about two million years ago, huge glaciers formed across much of northern North America. Although the glaciers never reached Florida, sea water was locked up as glacial ice, and worldwide sea level dropped. The Falling Waters area once more became stranded inland, high above sea level.

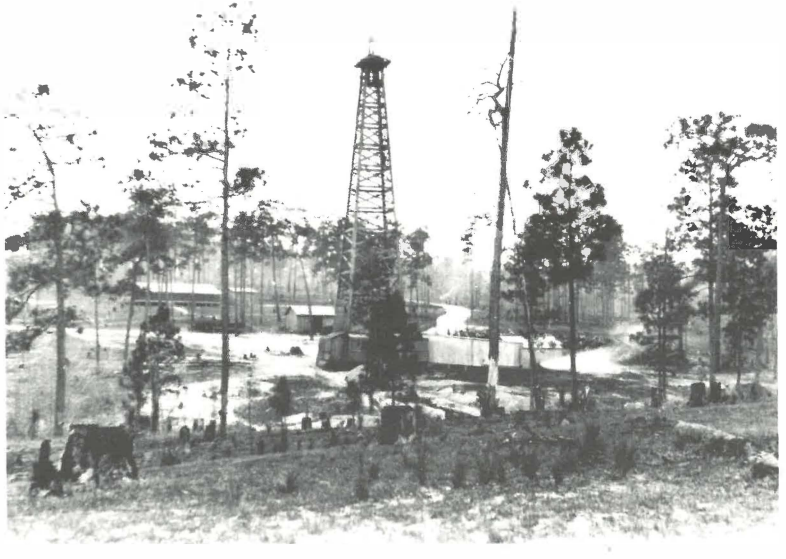
The newly exposed land was attacked by the forces of weathering and erosion. Streams removed and reworked sediments lying at the surface. The underlying limestone was also subjected to dissolving or ***dissolution*** by rain water, made slightly acidic by absorption of atmospheric carbon dioxide and organic acids in the soil. This water preferentially circulated along natural fractures, joints, and more permeable beds within the limestone. For millions of years, this percolating water slowly dissolved a network of caves, caverns, and vertical solution pipes through the originally solid rock. In some caverns, enough rock was dissolved so that the overlying sediments were no longer supported. When this happened, the overburden collapsed into the cavern, forming a sinkhole. Such an event created Falling Water Sink. Sinkholes and other collapse depressions are very common on the terrain around Falling Water Hill. Such a depression-pocked landscape formed on limestone is called ***karst terrain***.

Falling Water Hill, which attains a maximum elevation of about 320 feet above mean sealevel, is believed to be a remnant of a once more extensive highland area which spanned much of northern Florida. Over the millennia, extensive karst dissolution, coupled with erosion by surface streams, has lowered the land surface that surrounds the hill for miles in all directions. Today, Falling Water Hill stands as an erosional outlier, separated by lower terrain from hills of similar elevation to the west and south.

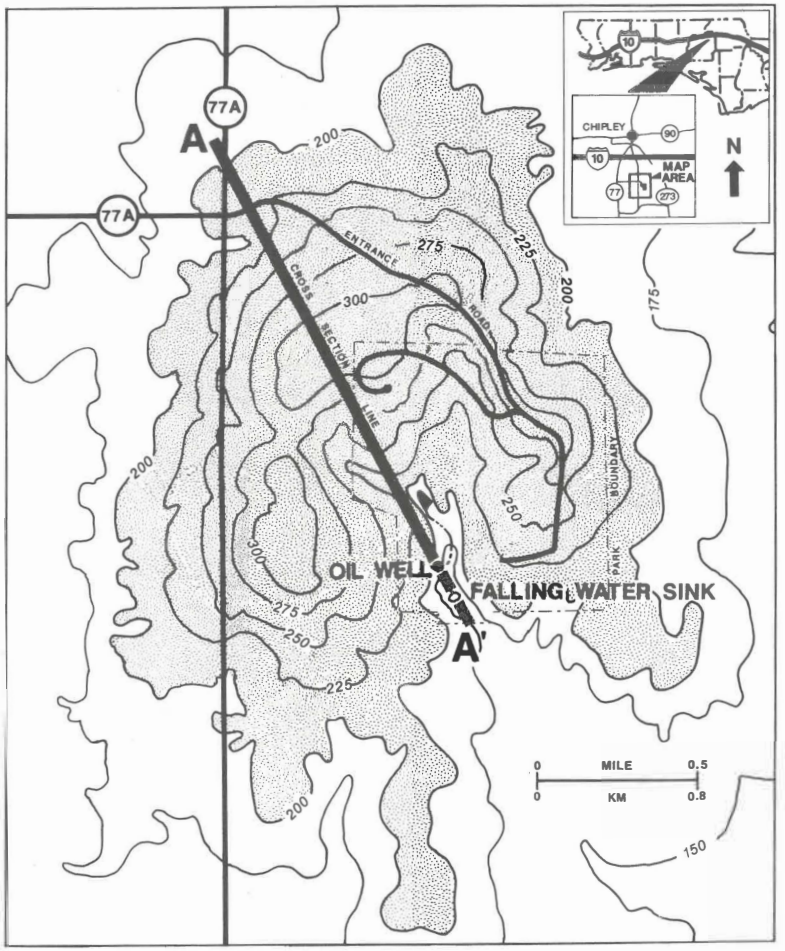
Falling Waters sink is situated on the south side of Falling Water Hill. The stream cascading into the sink is fed along its course by numerous small springs flowing out of the hill.

GEOLOGY

Much of our knowledge about the deeper rocks underlying Falling Waters Hill was derived from geologic samples recovered from one of Florida's first oil wells, drilled during the period 1919 to 1921 near Falling Water Sink. The well is situated just off the nature trail about 400 feet northwest of the sink overlook. It was drilled to a total depth of 4,912 feet below land surface. Although no oil was discovered, the rock cuttings brought up during drilling revealed a wealth of information about the deeper geologic formations. The deepest rocks encountered are marine sediments originally deposited in a vast sea which covered much of the southeastern United States during the Cretaceous Era, about 150 million years ago. Most of the overlying rocks are younger marine limestones, attesting to this area's long inundation by the sea. The near-surface rocks, including those exposed in the park today, represent



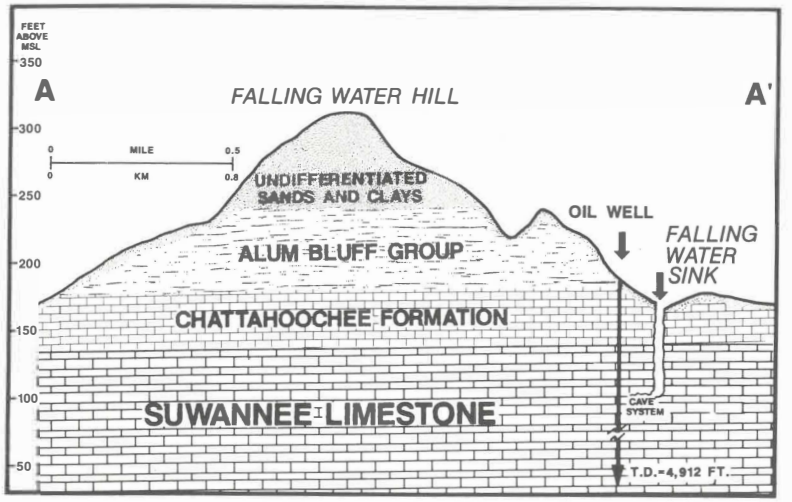
Derrick on the site of the Chipley Oil Company well, 400 feet northwest of Falling Water Sink, March 20, 1920. The well was a dry hole (FGS archives).



Topographic map of Falling Water Hill showing park boundary and the geologic cross section location.

the last 30 million years of earth history.

The base of Falling Water Hill is comprised of Oligocene Epoch Suwannee Limestone, which was deposited in a warm, shallow sea. This geological unit serves as an important freshwater aquifer throughout the local area. Microscopic fossils in the rock enable geologists to determine that the Suwannee Limestone was deposited approximately 30 million years ago. About 70 feet of Suwannee Limestone is exposed in the lower portion of Falling Water Sink.



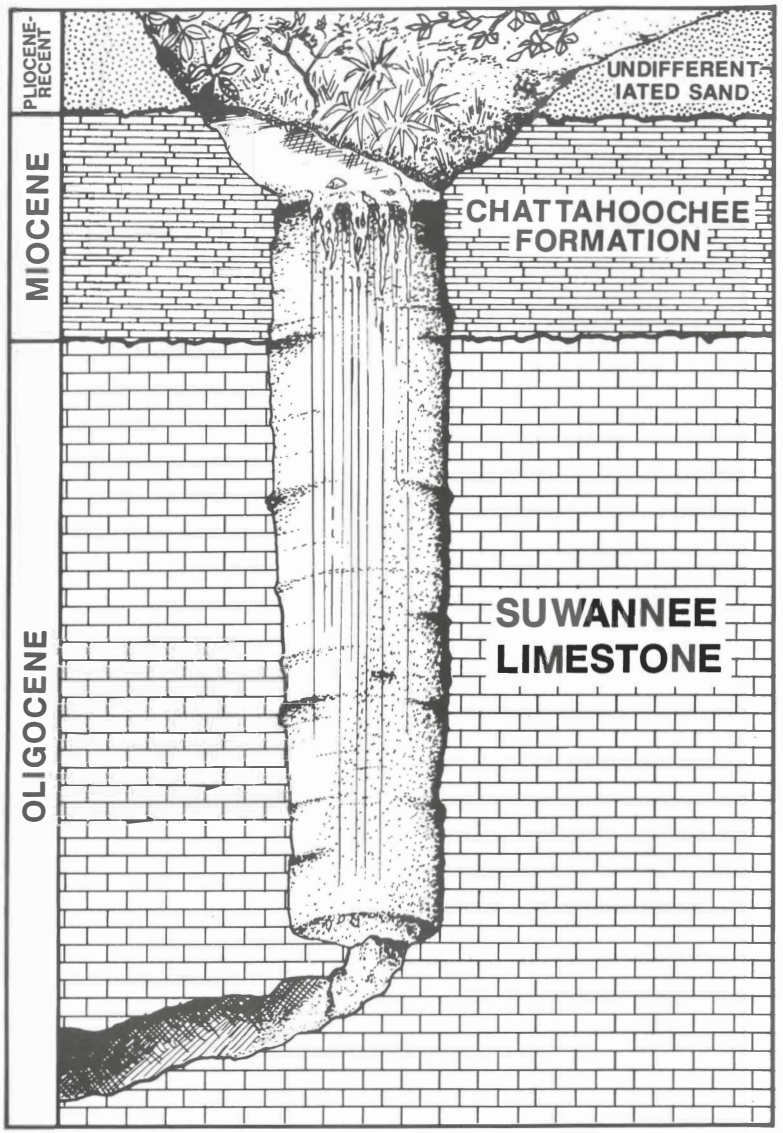
Northwest-southeast geologic cross section through Falling Water Hill.

Immediately overlying the Suwannee Limestone is a thinner and much younger limestone called the Chattahoochee Formation. This formation formed in a shallow sea during the Miocene Epoch, about 20 million years ago. The Chattahoochee Formation contains typical marine fossil shells such as pectens and oysters. Approximately 30 feet of Chattahoochee Formation is exposed in the sides of Falling Water Sink, above the Suwannee Limestone.

In much of Falling Water Hill north of the sink, a series of younger, Middle and Upper Miocene marine and deltaic sediments, called the Alum Bluff Group, overlie the Chattahoochee Formation. Locally, the Alum Bluff Group is comprised of unfossiliferous, green, clayey siltstone, attaining a thickness of about 50 feet under the highest part of the hill. Because of their elevationally higher position, these sediments do not occur in the walls of Falling Water Sink.

Capping Falling Water Hill and forming the uppermost sediments in the sink are a series of undifferentiated sands and clayey sands. These deposits represent river delta and marine sediments laid down during the last 5 million years.

Near the sink, the undifferentiated sands overlie the Chattahoochee Formation. North of the sink, they overlie the Alum Bluff Group, and extend to the top of Falling Water Hill, a total thickness of about 60 feet.



Geologic section in Falling Water Sink showing rocks deposited during the Oligocene, Miocene, and Pliocene-Recent Epochs.

SINKS

The most impressive sinks in the park, including Falling Water Sink, formed when the roof of an underground cavern or solution pipe collapsed. This caused the overburden sediments to slump into the cavity, opening a funnel, or a tube-shaped hole at the surface, and exposing the limestone bedrock in the walls of the sink. As the land surrounding Falling Water Hill was lowered by dissolution and erosion, the water table was also lowered sharply. The deep, tubular shape of Falling Water Sink may have been due, in part, to rapid downward dissolution in pace with the lowering of the ground water surface.

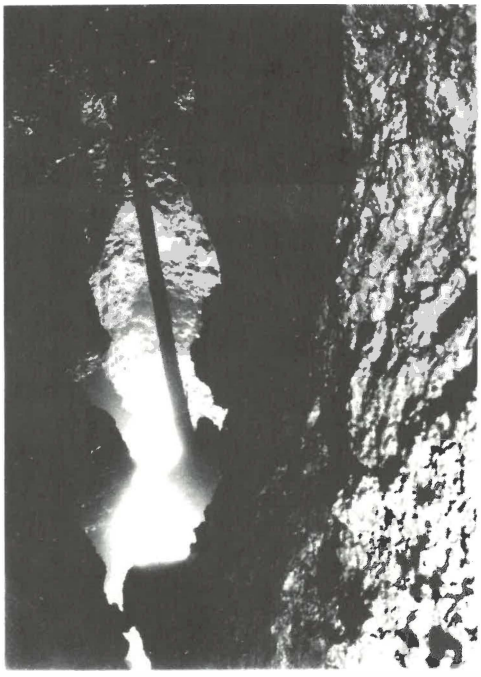
Many of the sinks in the area also take the form of cover-subsidence sinkholes. In this type, a bowl-shaped depression in the earth occurs, which does not open into a hole.

The age of formation of the sinks is uncertain, but it has probably been a continual process for many thousands of years. Geologists believe that the ground-water table was considerably lower during the Pleistocene sealevel lowstands than it is today . This may have left many of the formerly water-filled subterranean caverns high-and-dry, which, in turn, could have caused overburden collapse and sinkhole formation.

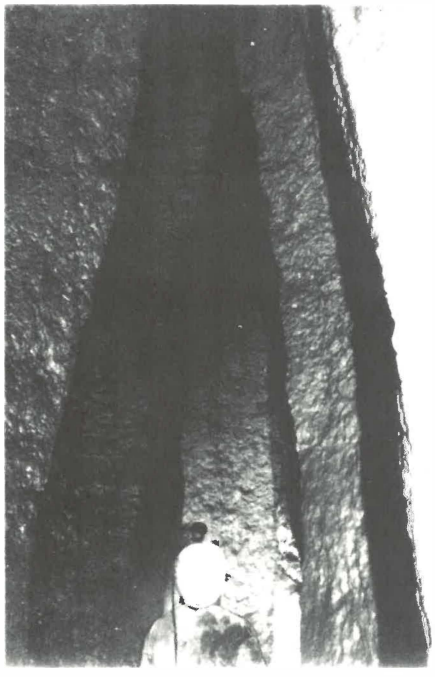
CAVES

Today, some of the caverns developed in the limestones under Falling Waters State Recreation Area are above the ground-water table, and contain dry, air-filled passages. ***Spelunkers***, or cave explorers, have mapped two stretches of cave in the park. These are shown on the accompanying map. One is the cave which drains Falling Water sink. This cave extends westward nearly 80 feet from the opening in the base of the sink. Water flows along the floor of the cave and disappears under an impassable limestone wall.

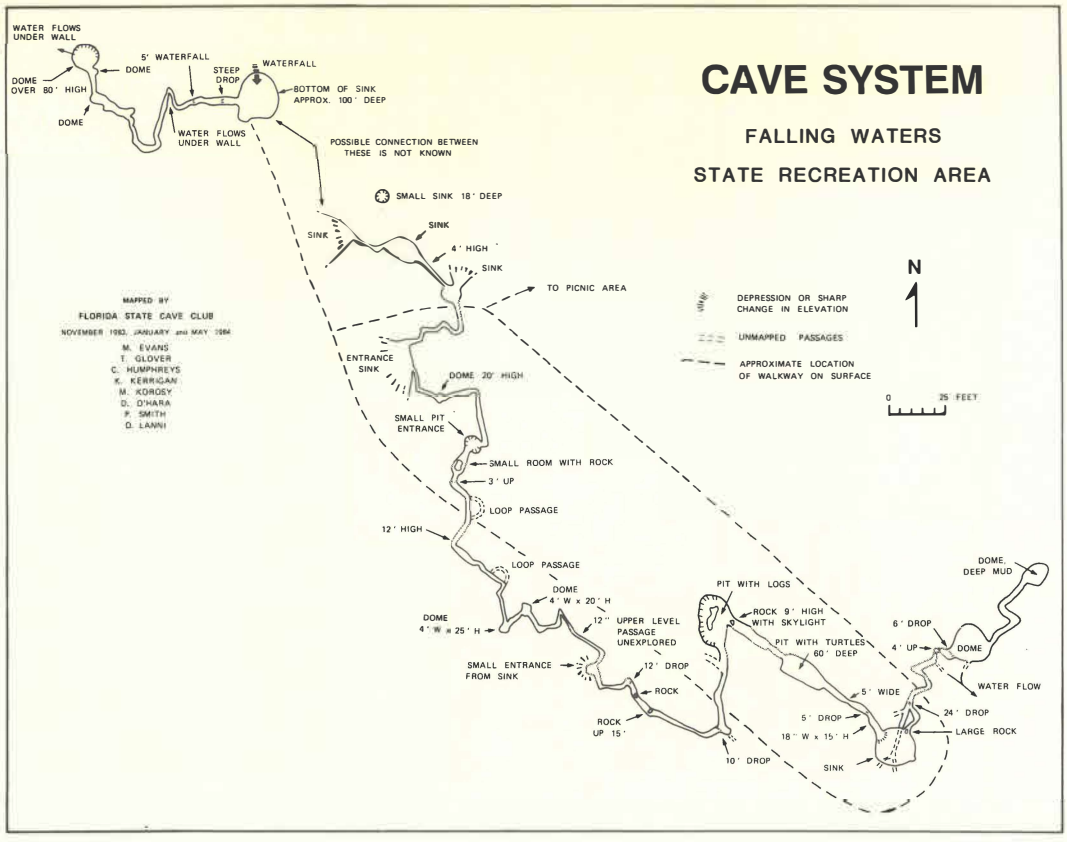
A second, larger cave system runs under the walkway below the Falling Water sink overlook. It zig-zags some 400 feet southeast of the entrance sink, with connections to various small surface sinks. As you walk along the sink loop trail, you may observe cave entrances in some of the sinks. Please remember that the caves are off-limits to all but experienced spelunkers who have obtained permission from the Florida Park Service.

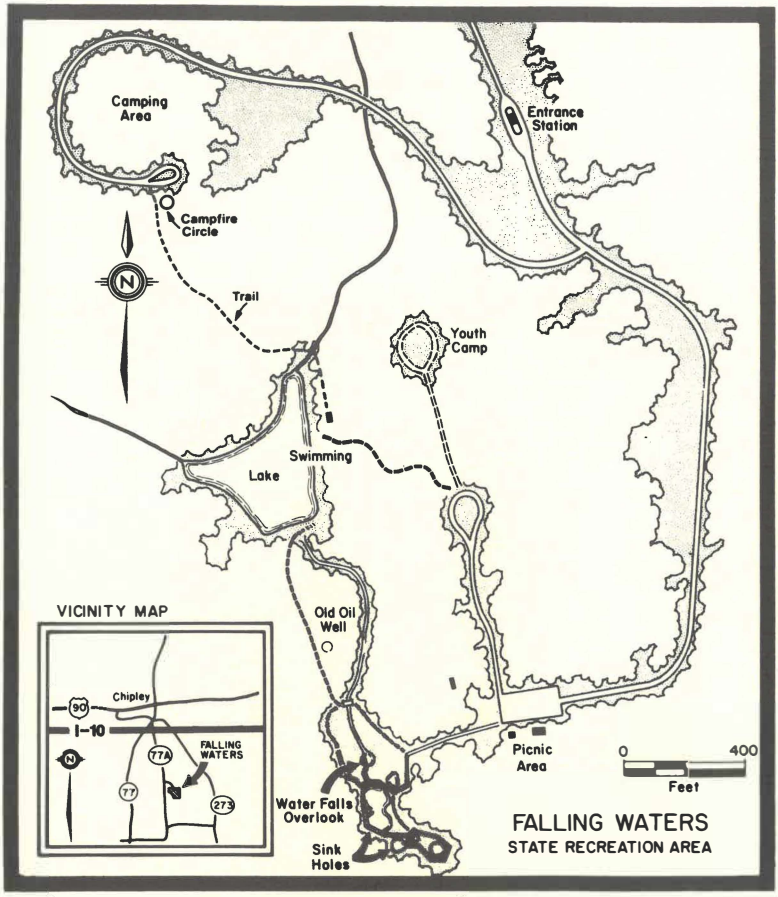


A typical cave passage within Falling Water Cave (photo courtesy Florida State Cave Club).



An 80 feet-high cylindrical dome in Falling Water Cave, deep under the Park (photo courtesy Florida State Cave Club).





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