Devil's Mill Hopper, Alachua County, Florida

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LOCATION

Devil's Mill Hopper is a large, impressive solution collapse feature located in west-central Alachua County, Florida, northwest of Gainesville (Gainesville West 7½- minute quadrangle). The State of Florida has incorporated the Devil's Mill Hopper sinkhole and the land surrounding it into the Devil's Mill Hopper State Geological Site. Figure 1 shows the location of Devil's Mill Hopper in relation to I-75 and Gainesville.

Access to the sinkhole is limited to the designated trails and a boardwalk to the bottom of the sink. Please follow all the site regulations. Sampling permits may be obtained for research purposes by contacting the Bureau Chief, Bureau of Park Programs, Division of Recreation and Parks, Florida Department of Natural Resources, 3900 Commonwealth Boulevard, Tallahassee, Florida 32303.

INTRODUCTION

The Devil's Mill Hopper represents one of the few natural exposures of the Hawthorn Group where greater than 15 ft (4.6 m) of the section is exposed. Much of the initial research on the stratigraphy of north Florida is based on this outcrop and other outcrops in nearby sinkholes.

Devil's Mill Hopper has long been considered an important geologic feature in Florida due to the thickness of sediments exposed in the walls. It was first discussed in the geologic literature by Johnson (1888) and later by Dall and Harris (1892) as an important reference section for the Hawthorn Formation (now Group; Scott, in preparation). The Hawthorn Formation was named by Dall and Harris (1892) as the "Hawthorne beds" for the phosphatic sediments exposed in pits near Hawthorne east of Gainesville in Alachua County, Florida. Since its inception the Hawthorne has been dropped, reinstated, redefined, and created continuing controversy. Scott (1983) provides a nomenclatural history of this unit. Currently, the Hawthorn Formation is being upgraded to group status (Scott, in preparation). Pirkle (1956) and Pirkle and others (1965) discussed the Mill Hopper as a "cotype" section with Brooks Sink in Bradford County for the Hawthorn Group. Besides being a reference section for the Hawthorn Group, the Devil's Mill Hopper is an example of an impressive karst feature.

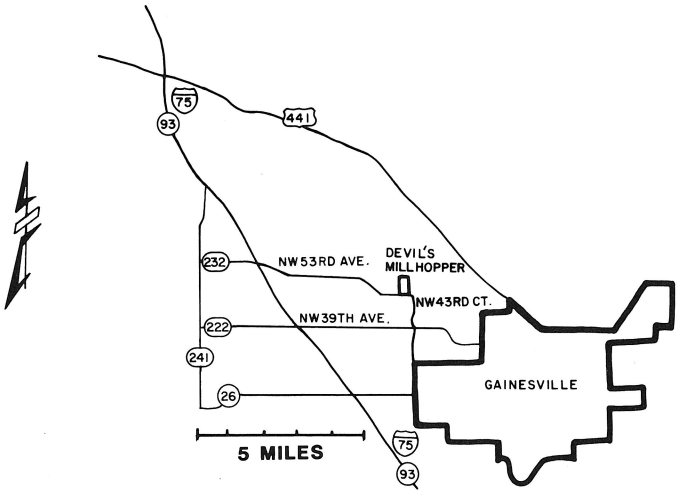

Figure 1. Location map, Devil's Mill Hopper geological site, Alachua County, Florida.

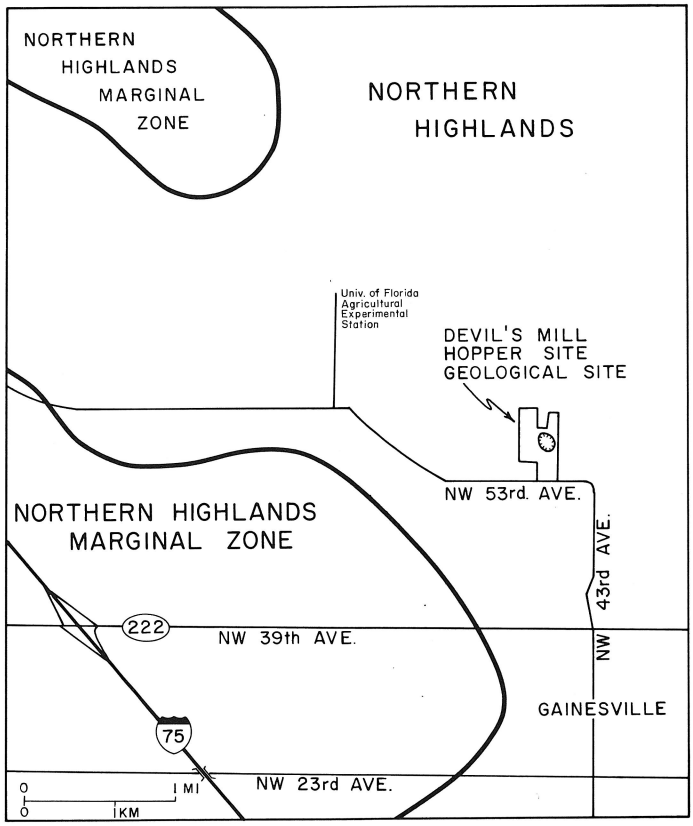

Figure 2. Location map of Devil's Mill Hopper state geological site showing physiographic zones, Gainesville 7½-minute quadrangle.

The Devil's Mill Hopper, a deep, steep sided, nearly circular sinkhole, occurs near the southern terminus of the Northern Highlands physiographic province (White, 1970; Fig. 2). The Northern Highlands are separated from the limestone plain of the Western Valley by the Northern Highlands Marginal Zone (Williams and others, 1977). The Devil's Mill Hopper is located very near the boundary of the marginal zone and the highlands (Fig. 2). It is interesting to note that karst features are significantly more abundant and well developed in the marginal zone than in the highlands. However, none of the karst features in the marginal zone are as deep or steep sided as Devil's Mill Hopper. The

Devil's Mill Hopper is a rather anomalous karst feature in the Northern Highlands and the marginal zone since most karst depressions in these areas are relatively broad and shallow.

Stratigraphically, the Devil's Mill Hopper exposes post-Hawthorn sands, the entire section of the Hawthorn Group present in the area, and the top of the Ocala Group (the Crystal River Formation). The sections measured range from 98.5 ft (30 m; Puri and Vernon, 1964) to 116.8 ft (35.6 m; Williams, and others, 1977). The variability of the section thickness can be attributed to: (1) topography of the post-Hawthorn and upper Hawthorn surface and the underlying Ocala Group surface, (2) where the section was measured in the sink, and (3) problems related to slumping of the sediments. Sediment slump has obscured much of the section in most of the sink. It is interesting to note that this section which has been referred to as "type" Hawthorn actually is lithologically atypical when compared to the remainder of the Hawthorn in north Florida. The Devil's Mill Hopper Hawthorn section is very clayey and is representative of an areally limited phase of the group. This makes formational picks difficult. Formational identities discussed in this paper are tentative.

The Florida Geological Survey drilled a core next to the Mill Hopper in 1980. Figure 3 illustrates the stratigraphic section in the core along with the outcrop. This core, Mill Hopper #1 W-14641, is permanently stored at the Florida Geological Survey in Tallahassee and is available for inspection. Mill Hopper #1 compares very favorably with measured sections taken from various areas of the Devil's Mill Hopper.

The oldest sediments exposed in the sinkhole and encountered in the core are the limestones of the Ocala Group (Crystal River Formation) of Late Eocene (Jackson) age (Fig. 3). First named by Dall and Harris (1892), the Ocala Limestone was later raised to group status by Puri (1957). The limestones are wackestones containing coarse to fine bioclastic debris. The Crystal River Formation typically is very fossiliferous containing foraminifera, mollusks, bryozoans, and echinoids. Induration varies from soft to very hard where replaced by silica. These sediments can not be seen from the boardwalk. Bishop (pers. comm., 1984) indicates that the Crystal River Formation can be seen only in a cavity at the base of the sink hidden from view by overgrowth.

Immediately overlying the Crystal River Formation, unconformably, are the mixed phosphatic clastics and carbonates of the basal Hawthorn Group (the Penney Farms Formation). The Penney Farms Formation is named for the town of Penney Farms, Clay County, Florida where the Florida Geological Survey drilled the type core, W-13769, Harris #1 (Scott, in preparation). Approximately 10 ft (3 m) of the Penney Farms is present in the Mill Hopper core. It is estimated that about the same footage is present in the sink (Fig. 3). The Penney Farms Formation is Early Miocene (Early to Middle Aquitanian; Scott, in preparation).

Sediments tentatively assigned to the Marks Head Formation unconformably overlie the Penney Farms. The contact and most of this unit appear to be covered by slumped material in most of the outcrop. Huddlestun (pers. comm., 1984) reintroduced the Marks Head Formation for part of the Hawthorn Group in southeast Georgia. The present author has extended the usage into northeast Florida. The sediments assigned to the Marks Head in the Mill Hopper core and outcrop are predominantly phosphatic clays and sands with some carbonate lenses and clasts noted in outcrop. Approximately 30 ft (9.1 m) of Marks Head are present at this site. The Marks Head Formation is considered late Early Miocene (Lower Burdigalian) in age (Huddlestun, pers. comm., 1983).

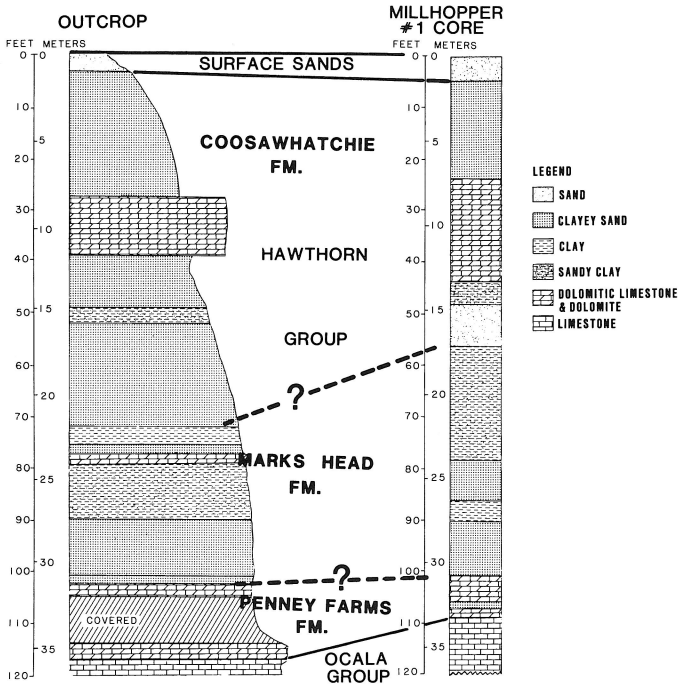

Figure 3. Comparison of Devil's Mill Hopper outcrop and Millhopper #1 core.

Unconformably overlying the Marks Head is the Coosawhatchie Formation. Huddlestun (pers. comm., 1984) proposed this unit for southeast Georgia and the present author has extended it into northeast Florida. This unit consists of phosphatic clays, sands, and carbonates. Approximately 40 ft (12.2 m) of the Coowachatchie are present. The massive carbonate seen near the top of the Devils Mill Hopper is in the upper part of the Coosawhatchie. The Coosawhatchie Formation is Middle Miocene (early Serravallian) in age.

Phosphatic to very phosphatic clay sands and sandy clays are recognized at the top of the Coosawhatchie Formation. Brooks (1967) suggested that these sediments are reworked. He noted that they contain a Late Miocene invertebrate fauna with occasional zones containing Pliocene land vertebrates. These sediments are included in the Coosawhatchie until further studies can be completed. Approximately 14 ft (4.3 m) of this unit are present in the core and 24 ft (7.3 m) in the sink. This is overlain by 3 to 10 ft (0.9 to 3 m) of loose, gray to brownish quartz sand.

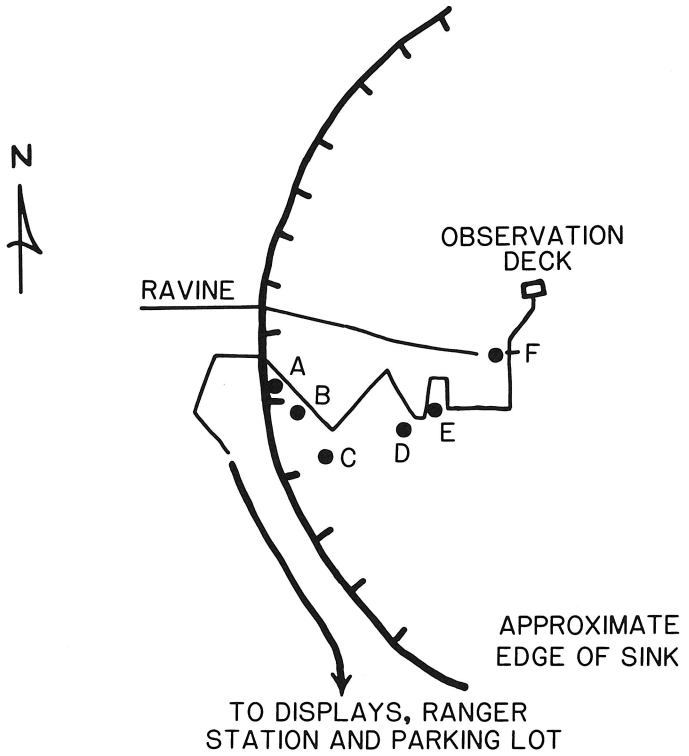

Figure 4. Schematic diagram of the west side of the Devil's Mill Hopper showing boardwalk into sink and points of interest, *A* to *F,* described in text.

SITE DESCRIPTION

Figure 4 is a schematic diagram of the boardwalk into the sink indicating where outcrops can be seen. A ravine enters the Mill Hopper from the west. The boardwalk roughly follows the south side of the ravine to the base of the sink. Where the boardwalk parallels the ravine near the top of the sink, blocks of carbonate can be seen in the stream. Occasional carbonate outcrops overlain by clayey, phosphatic quartz sand can also be seen. The clayey phosphatic sands crop out along the boardwalk at *A* on Figure 4. At *A* there is an outcrop approximately 4 ft (1.2 m) thick of the clayey phosphatic sand. This equates to the sands just above the limestone near the surface in Figure 3. At point *B* the limestone crops out next to the boardwalk.

Looking across the slope from *C* slump features are very common, obscuring a large part of the section. Several limestone blocks can be seen on the slumped slope. The limestone exposed above the slump and some of the sediments hidden by the slumped material are part of the Coosawhwatchie Formation. Just below the slumped slope sandy phosphatic clay and very clayey phosphatic sand crop out at point *D.*

The basal carbonate of the Hawthorn Group crops out at *E* and *F.* At *F* a small cavity can be seen. The light colored rock lying in the opening of the cavity is a carbonate cemented, slightly phosphatic, quartz sand. A small stream passes through the cavity, then under the boardwalk, winding its way out into the bottom of the sink.

At the end of the boardwalk near the base of the Devil's Mill Hopper is a small observation deck from which you can enjoy the spectacular flora and tranquility of this site. It is also a good place to prepare for the climb to the top more than 100 ft (30.5 meters) above you.

Upon reaching the top of the Mill Hopper relax and then take a leisurely stroll around the top of the sink on the nature trail. Where the nature trail crosses the ravine which enters the sink from the west you can see the upper limestone exposed in the stream. Enjoy the trail.

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