7 The Little Levels and the Hills Creek Basin

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Abstract

The Little Levels are a segment of the Greenbrier karst that may also be a segment of the Harrisburg erosion surface. The karst surface truncates the westward dipping Greenbrier Limestone. The underlying Maccrady Shale, an effective aquiclude is exposed at the land surface along the southeastern edge, forming a groundwater dam between the karst and the deeply incised Greenbrier River. All drainage in the central portion of the Little Levels is subsurface either east to Stamping Creek springs or southwest to Locust Spring. However, few parts of the underground are accessible to observation. The caves of the Little Levels are of intermediate size, one to two miles, and many carry active streams which allow some interpretation of the eastern and western edges, but not the central portion.

7.1 Introduction

The "Little Levels" is a name given to a low relief upland plateau with the town of Hillsboro roughly at its center (Fig. 7.1). US Highway 219 crosses the area from northeast to southwest. The upland is underlain by the lower units of the Greenbrier Limestone which is dissected into broad, shallow closed depressions. Surface drainage crossing the Little Levels consists of Stamping Creek to the northeast and Millstone Creek to the southwest. There are no surface streams crossing the central portion of the Little Levels (Fig. 7.2). Millstone Creek ends in the closed depression of Beards Blue Hole so that the western portion of the Little Levels drains only by underground routes. The topography of the Little Levels and its immediate surroundings are shown on USGS Hillsboro, Lobelia, Droop, and Denmar Quadrangles.

Electronic supplementary material
The online version of this chapter (doi:10.1007/978-3-319-65801-8_7) contains supplementary material, which is available to authorized users.

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The Little Levels are separated by Droop Mountain from the Hills Creek Valley to the west. The Hills Creek drainage is complex with a portion of the flow connected with the Little Levels while another portion drains through the Friars Hole cave system to the southwest (Chap. 8). Hills Creek and Bruffey Creek come into the discussion of both karst areas.

The caves of the Little Levels for the most part have been known for a long time. Many have large, obvious entrances that would be well-known to local residents. Davies (1949) reports at least partial descriptions of Beards Blue Hole, Blue Springs, Bruffey Creek Cave, Hills Creek Cave, the Hughes Creek Caves, Locust Creek Spring, Martens Cave, Martha's Cave, and Poor Farm Cave. Exploration by cavers from the 1950s onward extended many of these caves and added others. A listing and description including many of the smaller caves were given by Storrick (1992).

The cave descriptions that follow draw heavily on Storrick's account and on various unpublished documents. A caveat: much of the geomorphic interpretation depends on relative elevations of various springs, cave passages, and other features. Many of the available elevations were scaled from topographic maps which in this area have a 40-foot contour interval. Elevations in caves are given as depth below the cave entrance, but vertical controls on cave surveys often have a great deal of uncertainty.

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Fig. 7.1 Google Earth image of the Little Levels

7.2 Geomorphic and Geologic Setting

The Little Levels is a doline karst at an elevation of 2300–2400 ft. The area was interpreted as a remnant of the Harrisburg erosion surface by White and White (1991). The limestone dips to the west so that the eastern edge of the surface is the contact between the limestone and the underlying Maccrady Shale. On the eastern edge of the Little Levels, the land drops off sharply into the incised valley of the Greenbrier River at an elevation of 2050 ft. The shale and the underlying Pocono Sandstone form a groundwater dam that prevents underground drainage from reaching the river by a direct route. Stamping Creek has cut a deep gorge through the clastic rocks between Mill Point and the river as has Locust Creek on the western side.

The high plateau to the west is collectively known as the Yew Mountains which reach elevations of 4000–4500 ft. The sandstones, conglomerates, siltstones, and shales are only slightly deformed and have a generally westward dip. The plateau has been dissected by the westward flowing Williams River, Cranberry River, and Cherry River into fragments which are also called mountains and have individual names. Immediately to the north of the Little Levels is Little Mountain with a high point of 3400 ft. To the northeast, Rogers Mountain separates the Little Levels from the Swago Creek Basin. The western boundary is Droop Mountain, a topographic and structural anomaly because the Greenbrier Limestone also crops out on the west side to produce the highly karstic Friars Hole Valley. Droop Mountain has a narrow flat top at 3000 ft elevation because of the erosional resistance of the Droop Sandstone, a unit of the Mauch Chunk Formation. There is evidence for structural complexity, likely one or more faults, within Droop Mountain that accounts for its survival as a north–south barrier across the karst.

7.3 The Stamping Creek Drainage

Stamping Creek originates on a saddle of Cranberry Mountain at an elevation of 4100 ft. It flows down a long valley cut deeply into the Yew Mountains (Fig. 7.3). Stamping Creek sinks in its bed near the limestone contact but maintains a surface channel which is dry under low-flow conditions (Fig. 7.4). The resurgence of Stamping Creek is at a group of springs 1200 ft upstream from the highway

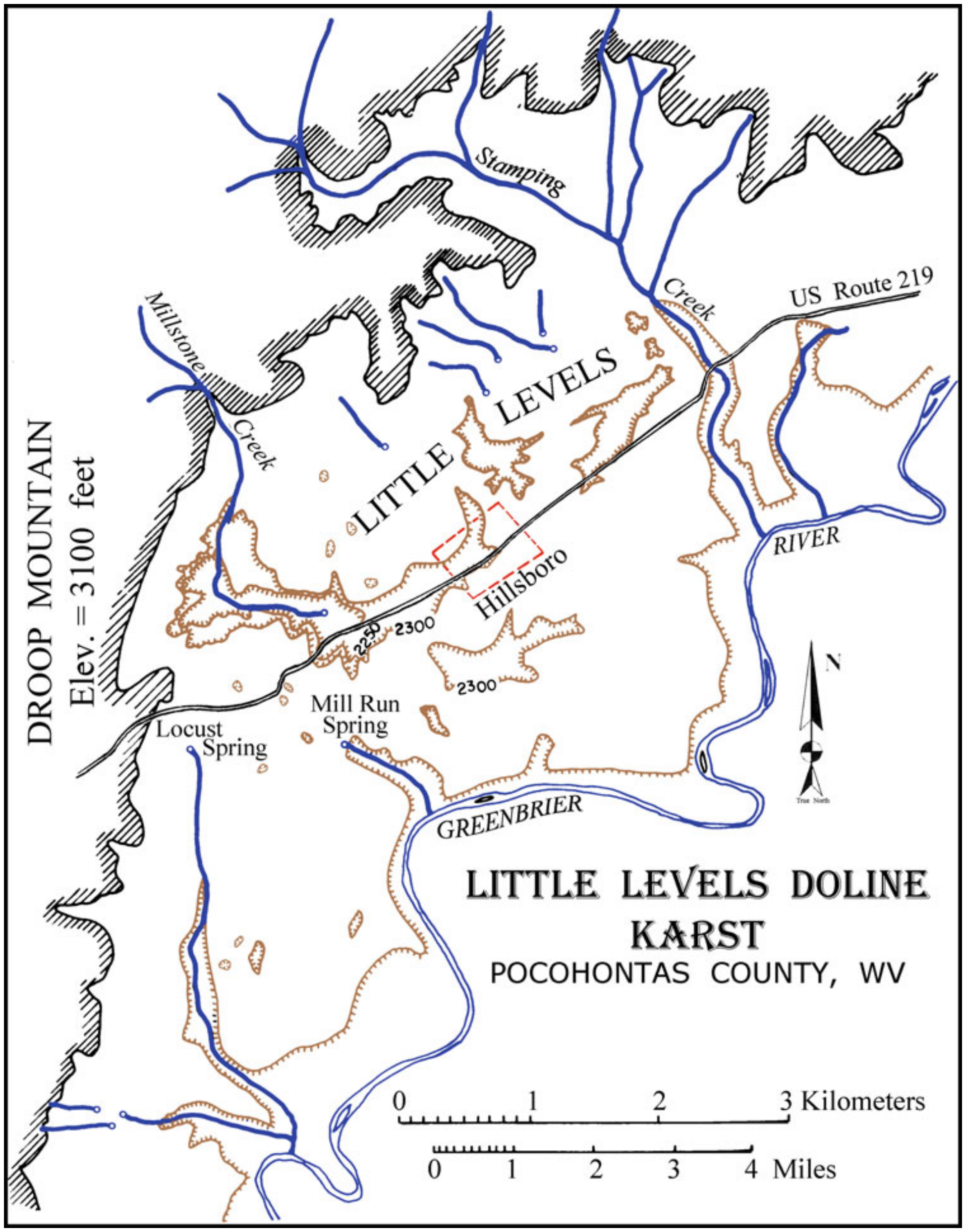


Fig. 7.2 Map of the Little Levels showing the largest closed depression

intersection at Mill Point. The spring southwest of the surface channel is the entrance to Blue Spring Cave. To the northeast of the surface channel, close to the highway are a group of springs called the Roadside Resurgences. A dye trace from a sink point in the stream channel about 3 miles upstream appeared at the Roadside Resurgences but not at Blue Spring Cave. Both springs are in the Hillsdale Limestone at an elevation of 2196 ft. Curiously, Blue Spring is shown on the USGS Marlinton 15-min quadrangle (1923) but not on the Hillsboro 7.5 min quadrangle (1977).

7.3.1 Blue Spring Cave and Spring

The cave entrance is a 20-foot wide by 6-foot high opening at the head of wooded alcove. Inside, one can follow a stream passage for 1500 ft to a breakdown room (electronic map M-7.1). Straight ahead, dry passages can be followed to the south for about 500 ft. The stream in the entrance passage rises from the breakdown. At the breakdown room, the main passage turns sharply to the north and can be followed as a walking height passage and then a stoopway for an

Fig. 7.3 The Stamping Creek Valley seen from route 150 on top of Cranberry Mountain. Photo by W.B. White

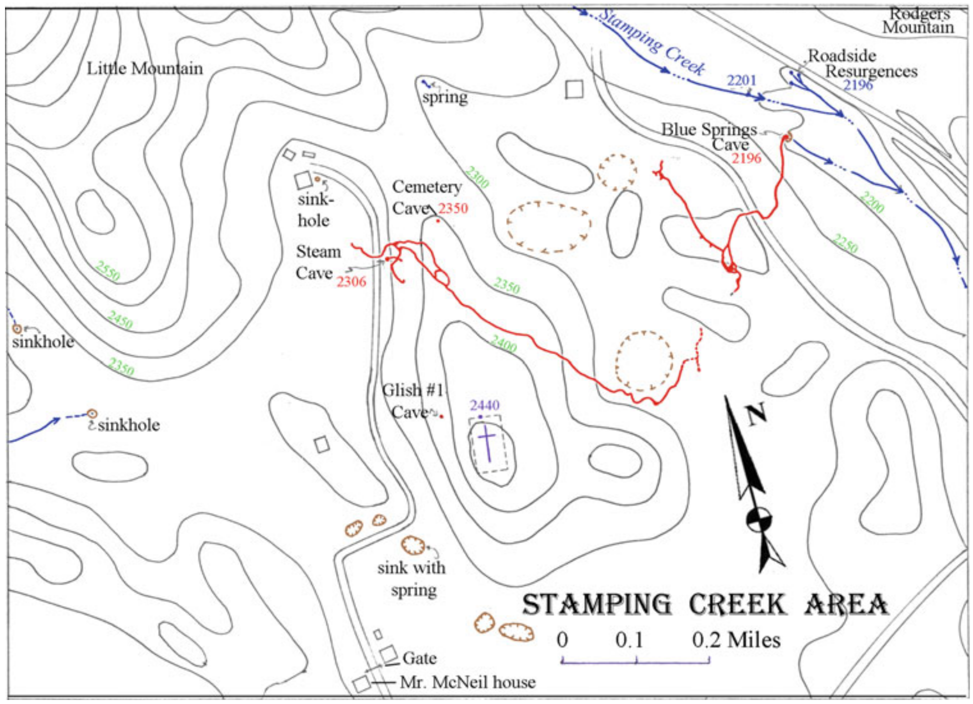
Fig. 7.4 The dry channel of Stamping Creek upstream from the springs. Photo by W.B. White

additional 1500 ft. There are three sumps in three short side passages along the west wall of the passage at 600, 850, and 1200 ft from the sharp turn. At the end of the passage is another sump. Continuing ahead is a narrow tube that ends after 150 ft in yet another sump. The north passage appears to be an overflow route with the main discharge in a lower inaccessible passage.

7.3.2 Steam Cave

Relatively little is known about the internal drainage of the Little Levels. Steam Cave is a half-mile fragment of stream passage with the stream flowing east toward Blue Spring to which it has been dye-traced (Fig. 7.5).

Fig. 7.5 The eastern edge of the Little Levels showing the relation of Steam Cave, Blue Springs cave and the resurgence of Stamping creek. Redrawn from an original map by F. Potter in 1965



The entrance is an obscure 10-foot pit in an open field at an elevation of 2306 ft. At the bottom, a canyon passage leads 50 ft to a junction. Straight ahead, the passage descends a flowstone slope and ends in a flowstone choke. To the right, the passage can be followed for about 100 ft, becoming a low crawl and ending in breakdown at the edge of the hillside. To the left, and beneath a shelf, is a crawlway leading deeper into the cave, reaching the stream passage after 50 ft (electronic map M-7.2).

Upstream, the passage can be followed for 300 ft to a low airspace that continues with some air flow. Downstream, the cave stream and two parallel dry crawlways can be followed to the southeast for 150 ft where the crawls merge and open to pleasant, dry, walking passage 10 ft high and 10–15 ft wide. The stream, an incised canyon, occasionally intersects the dry passage. The dry passage also gradually becomes more canyon-like and trends southeast for 350 ft to a junction with the stream. Beyond, the cave is a wet walkway for 600 ft to a junction with an upper level passage entering from the east. This passage ends in mud fill after a short distance.

Beyond the junction, the cave trends more to the east and drops through a series of rapids and pools in a passage up to 30 ft high. After several short downclimbs in the water, the gradient decreases and the passage turns to the northeast with two natural bridges across it. The passage becomes lower and finally ends in a sump. The sump is about 500 ft from the nearest point in Blue Spring Cave. The sump is 91 ft below the entrance, at an elevation of 2215 ft, only 19 ft above the elevation of Blue Spring. The stream flow in Steam Cave is reported to be significantly less than the flow in Blue Spring, indicating other unobserved tributaries.

7.3.3 Cook Pot

The top of the Greenbrier Limestone lies on the slopes of the surrounding mountains several hundred feet above the Little Levels. Tributary streams flowing from the sandstones and shales of the upper slopes sink near the limestone contact, but the slopes seem to be poorly explored and there are few reports of inlet caves. An exception is Cook Pot. The entrance pit is on a tributary of Stamping Creek named Tilda Fork on the topographic map at an elevation of 2750 ft. Cook Pot, with 1.42 miles of survey, is an excellent example of a high relief inlet cave and is described in detail. The original description was published by Medville (1971). The description was reproduced by Storrick (1992) and is reproduced again below (electronic map M-7.3)

The entrance is an unobtrusive 30-foot pit with a second 12-foot drop at the bottom. At the base of the pit, a passage leads downward for 10 ft and intersects a shaft, the floor of which is 20 ft below the passage. Four passages lead off from the base of the shaft. Two end in breakdown, third becomes too low to follow, and the fourth leads to the continuation of the cave. The continuation passage is an obvious belly crawl from the bottom of the shaft which can be followed for 30 ft to the top of another drop. Rather than descending the drop at the end of the crawlway, one continues out over the drop by traversing over an open-bottomed canyon for another 30 ft to a large chockstone from which one can descend a free 43-foot drop into the room below.

At the base of the 43-foot drop, the cave continues in two directions. To the northeast, the passage can be followed upstream for about 1000 ft through a series of dry crawls, narrow canyons, and high domes. These domes are 40–60 ft in height and are about 20 ft in diameter. At the extreme upstream end of this section, the stream emerges from a sump but the passage continues indefinitely as a crawl over gypsum sand.

To the southwest of the 43-foot drop, the passage can be followed as a stoopway and crawlway for 250 ft to a major passage junction—Fork falls. This waterfall is 15 ft high and can be down-climbed on large breakdown blocks. The stream at the falls can be followed downstream for 350 ft through a low wet passage to another junction. Continuing 15 ft beyond Fork Falls, one comes to a second passage junction. Here the cave can be followed right (north) or left (south) in large passages. A second stream flows in this passage and parallels the Fork Falls stream. Following this stream upstream to the north, one traverses a long ledge to the top of another waterfall, Spoon Falls, and can follow the stream upstream for more than 1500 ft through a series of large domes. These are the largest in the cave. The dome-stream complex in the northwest end of the cave has not been completely explored.

Following the Spoon Falls stream downstream to the south at the passage junction just beyond Fork Falls, the cave continues for 200 ft as a 20-foot wide, 30–50-foot high passage. A small stream enters this passage from the west. It is possible to follow this stream for about 250 ft to a breakdown choke. After the large passage, the Spoon falls stream can be followed through a low crawl for 100 ft to a small done and a passage junction. Going left (east), one climbs up out of the stream passage and into dry canyon. This can be followed for 50 ft to the Fork Falls stream. Continuing straight ahead in the Spoon Falls stream (south), the cave continues as hands and knees crawl for 50 ft to a second junction. Again, by going left (east) and following the stream, one arrives at the Fork Falls stream. The combined stream then continues to the south. If, instead, one continues to the south at the second junction, dry walking passage is entered. This can be followed for 1500 ft to a series of domes. This section of the cave is dry, pleasant, and contains some nice flowstone and rimstone pools.

At the junction of the Fork Falls and Spoon Falls streams, the main part of the cave continues to the south. Beginning as walking passage, the ceiling soon drops to within one foot of the floor and with minor variations, remains there for the next 500 ft. This section of the cave is a long, wet, rocky crawl which can be unpleasant in wet weather and tiring as one leaves the cave. Beyond this crawl, the floor starts to drop and one follows a canyon passage 10–15 ft high for another 300 ft. One then comes to the last drop in the cave, this one being 32 ft down the side of a canyon. It is also possible to descend via a 30 foot waterfall just upstream from this drop. Below the 32-foot drop, one continues to the south for 100 ft to a 10-foot drop into a deep pool. This can be bypassed by traversing a ledge to the left (east) wall of the passage and chimneying down to the stream.

The cave continues for about 1000 ft as a 30-foot high and 6-foot wide passage to junction. To the left at this junction, one can follow large dry passage over breakdown for 200 ft to a terminal breakdown choke. A small stream entering this passage from an adjacent dome can be followed through a pit in the floor to the main cave stream. Continuing straight ahead at the last junction, a large dome, 50 ft high and 30 ft wide, is crossed. The main cave stream enters this dome from a low passage at its base, and a side stream enters via a 20-foot high overhung waterfall. A passage on the right (north) side of this dome climbs steeply until it is 30 ft above the dome. This passage can be followed for several hundred feet until it rejoins the main cave stream upstream from the dome. One can chimney up in this passage for another 20 ft through loose boulders to enter a large upper room. The upper room is about 100 ft in diameter, up to 20 ft high, and has several passages leading off from it.

From the upper room, one can gain access to the stream passage above the overhung waterfall that enters the dome below. This stream rapidly becomes too low to follow. Other passages leading from the upper room become quite small, although exploration here is not complete. Below the room, the main cave stream continues downstream for another 200 ft to the south as a low, wide passage. This passage ends in massive breakdown from above. Apparently at this point, the three passage levels in the cave, which are above one another, have joined to produce the breakdown. The cave terminates beneath a large surface sinkhole, 60 ft across and 30 ft deep.

The final sump of the cave stream is 223 ft below the entrance, placing it at an elevation of 2527 ft. This is about the elevation of the Little Levels surface and more than 300 ft above the elevation of the Blue Springs where the water is most likely to emerge. The entrance is near the top of the Union Limestone. The cave crosses the entire thickness of the Union and Pickaway Limestones with steep gradients, multiple drops, and many vertical shafts.

7.4 Locust Spring

Locust Creek rises at Locust Spring at an elevation of 2090 ft (Fig. 7.6). The stream flows southward for several miles in an incised valley with a small floodplain to its confluence with the Greenbrier River. Locust Spring emerges from the Hillsdale Limestone at the base of Droop Mountain. Locust

Fig. 7.6 Locust Spring. Photo by W.B. White

Spring is the drainage outlet for the western side of the Little Levels and also for a portion of the Hills Creek Basin on the other side of Droop Mountain.

The stream emerging from Locust Spring is sumped a short distance inside except during exceptionally dry weather. In dry times, it is sometimes possible to pass this section (Sump I) without diving equipment and enter a short section of walking passage. About 200 ft inside, a small waterfall enters the right side of the passage while the stream flows under ledges and breakdown. In a short distance, the passage has wall-to-wall water and the ceiling lowers to form Sump II. There is a passage under the left wall that goes upstream as a sump (Sump IIA) for about 250 ft leading to the main part of the cave (electronic map M-7.4). If the stream passage is followed, Sump IIB is reached. On the upstream side of this sump, the passage splits but both passages quickly end in breakdown with water coming out of the breakdown.

Upstream from Sump IIA is a walking passage that leads to a breakdown slope and a segment of large breakdown-floored trunk. This passage leads to a junction of two upstream passages. The right-hand passage carries most of the water that drains to the spring. The water has not been traced as an individual inlet. This stream can be followed for about 800 ft to a breakdown collapse. The stream emerges from the breakdown pile. Above the collapse is a large chamber with a passage heading southwest.

Back at the passage junction, the left-hand passage trends more or less southwest under the flank of Droop Mountain. This is the largest continuous passage in the cave although it doesn't carry much water. About 1400 ft upstream, a large passage comes in from the right. This is the other end of the southwest passage at the breakdown chamber. After another 1200 ft, the main passage intersects a fault. The passage becomes filled with breakdown with the stream underneath and can be followed until completely blocked by breakdown.

The main passages in the cave trend northeast–southwest and are thus more or less parallel with the trend of Droop Mountain well under its southeastern flank. At least three individual infeeders have been identified and there may be more under the breakdown. None of these has been individually connected to any of the sinking streams that have been dye-traced to Locust Spring. The stream at Sump IIB might be the infeeder from Beard's Blue Hole, and the large stream emerging from the Breakdown Chamber might be Hills Creek but this is purely conjecture.

7.5 The Millstone Creek Drainage

Millstone Creek rises on Viney Mountain at an elevation near 3400 ft. It flows off the clastics and sinks at the limestone contact where it reaches the northwest corner of the Little Levels. Although shown as a blue-line stream on the topographic map, in reality Millstone Creek is a grass-grown channel where it winds around the western edge of the Little Levels. The channel ends at Beards Blue Hole. Storm waters overflow the sink points on the mountain and go underground at Beards Blue Hole. There is no continuation of the channel downstream. Millstone Creek and its associated caves and surface karst are shown on the intersecting corners of Lobelia, Hillsboro, Droop, and Denmar quadrangles.

7.5.1 The Hughes Creek Caves

There are two Hughes Creek Caves, one above the Taggard Shale and one below. The cave entrances are in an alcove cut into the east flank of Droop Mountain. Under moderate flow conditions, a stream emerges from the upper cave, flows about 400 ft in a surface channel and then sinks into the lower cave as a waterfall over a lip of Taggard Shale (Fig. 7.7). The upper cave is formed in the Pickaway Limestone; the lower cave in the Patton Limestone.

The entrance to the upper cave is at the base of a 30-foot wide, 20-foot high limestone headwall. The entrance is a low opening which enlarges to a trunk 30 ft wide and 6–8 ft high (Fig. 7.8). At low flow, the cave stream sinks in a narrow slot in the floor and the outside channel is dry. At moderate to high flows, the stream emerges from the entrance. The cave passage is tubular, with large clay banks along the stream (electronic map M-7.5). It ends after 300 ft in a room at the edge of a large breakdown. Here there are three choices. One can climb up the breakdown, eventually reaching nearly 100 ft above the entrance. One can stay low, crawl in the stream, and follow the stream circumnavigating the breakdown pile for 500 ft until the passage chokes out in breakdown. The final choice is to traverse a ledge above the stream passage and reach an upper level tube, much the same size as the stream passage, and which doubles back, parallel and above the stream passage. This passage ends in breakdown against the hillside near the cave entrance.

The entrance to the lower cave is a hole in the stream bed where the Taggard Shale has collapsed into the underlying cave passage. Lower Hughes Creek Cave is an excellent example of what Palmer (1975) has called a floodwater maze (Fig. 7.9). Passage walls are covered with small scallops indicating high flow velocities. Passages tend to be washed clean. The cave has a maze pattern with every available joint opened by dissolution. The passages tend to be 6–10 ft high and 3–6 ft wide. Passages tend to follow a N20°E joint orientation.

By following the passage on the west side of the cave for about 500 ft to the south, one reaches the stream flowing from the upper cave. It can be followed downstream for another 150 ft to a junction with another stream coming from the north. The combined streams flow into a terminal pool 3–4 ft deep, 50 ft across and with about a foot of airspace. On the east side of this pool is a breakdown area with muddy passage above. This is the downstream end of the cave stream and is beneath the west side of the next valley to the east of the cave entrance.

The surface stream channel slopes downward from the entrance of the upper cave to the entrance of the lower cave. A surface channel continues beyond the lower cave entrance, but it slopes upward in the downstream direction to eventually intersect the channel of Millstone Creek. During high flows, the lower cave completely floods, finally forming a lake over the entrance. The lake rises, spreading along the channel until it finally spills over into Millstone Creek.

7.5.2 Martha's Caves

There are two Martha's (or Martha Clark's) Caves, an upper and a lower. Both entrances are in a 50-foot high cliff in a

Fig. 7.7 Surface segment of stream connecting Upper and Lower Hughes Creek caves and the entrance to Lower Hughes Creek cave. Photo by W.B. White

Fig. 7.8 Water crawl into the entrance of Upper Hughes Creek cave. Photo by W.B. White

low hill on the south side of Millstone Creek with the lower cave entrance at an elevation of 2250 ft and the upper cave 2277 ft. The entrances are located very close to the southwest corner of the Hillsboro Quadrangle. The exact stratigraphic relations are not known but probably the caves are in the Patton (possibly Sinks Grove) Limestone. Martha's Caves were explored and surveyed by members of the Pittsburgh Grotto in the early 1960s, and they produced the map included in this volume (electronic map M-7.6).

The lower entrance passage is 2 ft high and 30 ft wide, but increases to 8–10 ft high 40 ft inside. Breakdown nearly blocks the passage just beyond this point, but one can continue and enter a large passage with a ceiling height of 15–35 ft. Six hundred feet from the entrance, a side passage on the right leads northeast for 200 ft to a fork. The right fork leads upstream for 170 ft and then ends in a breakdown choke. The left fork heads downstream and becomes too tight to follow after 350 ft.

The main passage continues past the side lead another 500 ft in 15–25 foot high, 40 foot wide trunk passage to a second junction. One hundred and fifty feet up this passage is a third stream than can be followed downstream through Katherine's Ramble for an addition 450 ft to a breakdown slope.

The main passage continues for 400 ft past the second junction, through a breakdown walled area (the Chaos) to where it reaches the first of a series of pools known as the Great Wet Way. The pool's area is 300 ft long and intersects a large upper level trunk passage. One can follow the trunk northeast for 500 ft, there it overlies the Great Wet Way, or continue 1500 ft southeast in an increasingly large passage known as Alice's Gallery. Passage dimensions increase to 50 ft high and 120 ft wide before ending in a large breakdown room (the Rubble Room). A left side passage, 500 ft from the end (Dallas' Alley), terminates in a breakdown choke after 200 ft.

The entrance to the upper cave is to the left of the lower entrance and 27 ft above it. A 10-foot high, 10–15-foot wide passage heads southwest for 600 ft to where it intersects a stream passage. To the left, one can follow the stream passage upstream for 350 ft to a breakdown choke. The main passage, downstream, continues 250 ft to where a second stream joins it from the left. This stream can be followed upstream 300 ft to a 45-foot shaft with a waterfall. The downstream passage continues 1500 ft through silt banks until the cave finally ends in a mud fill and sump. Along the way one passes a 40-foot waterfall in a shaft on the right.

Although the individual flow paths have not been sorted out, it appears that the Martha's Caves are the convergence of many flow paths from the Little Levels draining toward Locust Spring still 4000 ft to the southwest. The stream gradients in the caves are relatively low with the lowest point in the lower cave only about 40 ft below the entrance. This would place the elevation at the final sump at about 2200 ft, still about 100 ft above the spring. The elevation difference suggests that both upper and lower caves remain in the Patton Limestone.

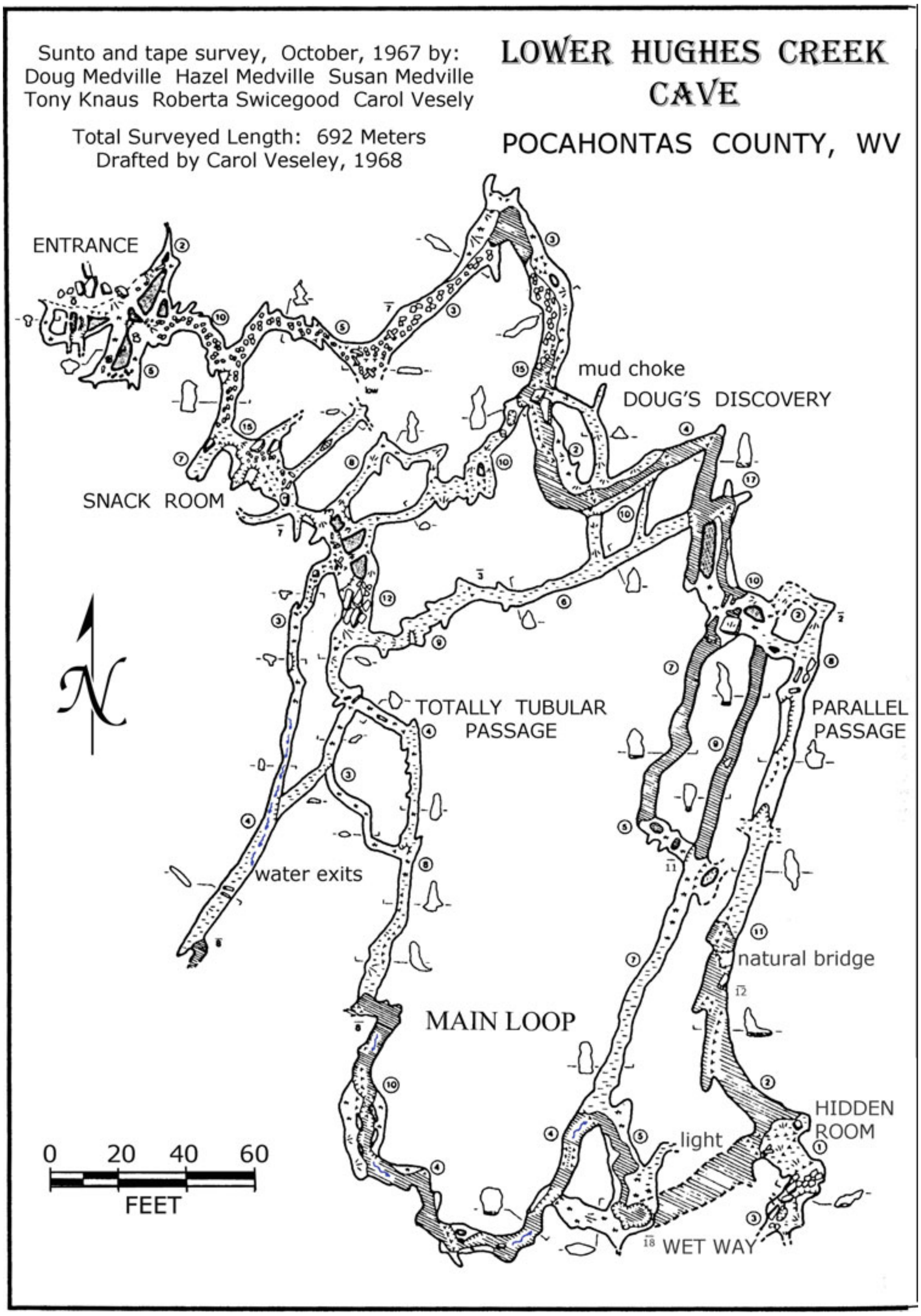


Fig. 7.9 Map of Lower Hughes Creek Cave. From Storrick (1992)

7.5.3 Beards Blue Hole

Beards Blue Hole is the downstream terminus of Millstone Creek. It is a large vertical-walled sinkhole at the bottom of which is a deep pool which is the sump for several infeeders that drain into the sink. On the southwest side of the sink, 2–4-foot high, 6-foot wide stream passage can be followed upstream 550 ft through two pools to the mid-west entrance. This small hole was dug open and emerges into the bed of Millstone Creek. Beyond this entrance, a small crawl leads 200 ft to the west entrance. A second stream enters the pit from the north. This passage, which can be followed for 300 ft to a sump, has been dye-traced from Grand View pit, half a mile to the northeast.

Located in the southwestern corner of the Little Levels in the same large closed depression as Martha's caves, the rising dip of the bedding suggests that Beards Blue Hole is in the Hillsdale Limestone. The pool has been traced to

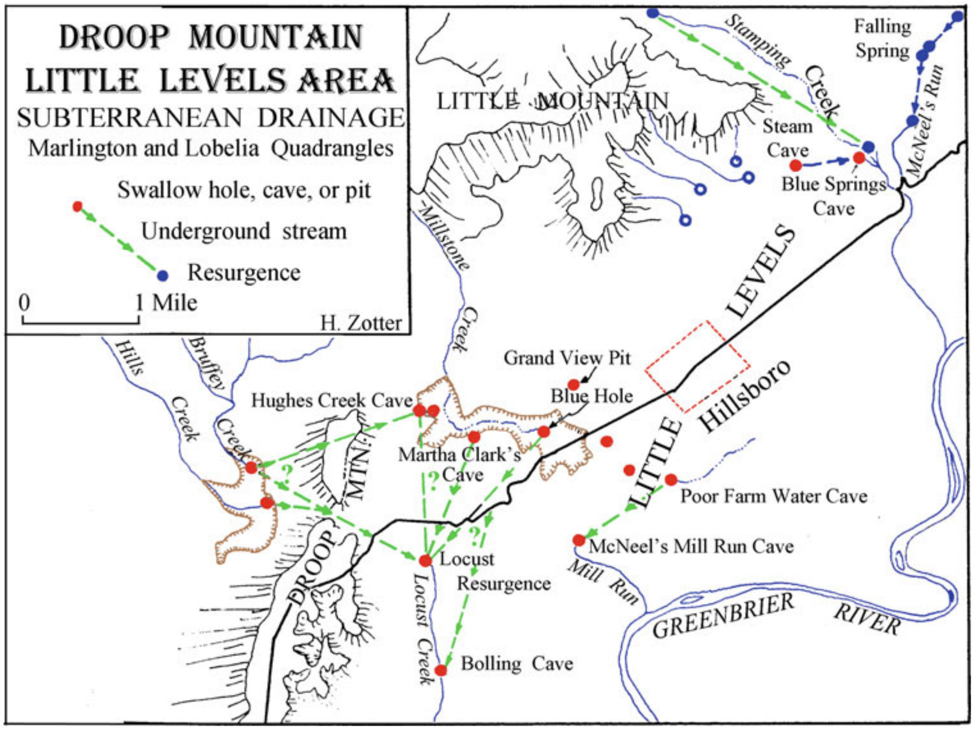


Fig. 7.10 Dye-tracing connections established for the Little Levels. Adapted from Zotter (1965)

Locust Spring. This area of the Greenbrier karst was the subject of Zotter's (1965) pioneering dye-tracing studies and most of what is known about the hydrologic interconnections of the underground drainage in the Little Levels is due to her investigations (Fig. 7.10).

7.6 Poorfarm Cave

Poorfarm Cave is one of the best known caves in the Little Levels. It was described in detail by Davies (1949) and was intensively investigated by Wolfe (1973) as part of his PhD dissertation on cave sediments. The Wolfe map was reproduced along with a detailed description by Storrick (1992) and is reproduced again as electronic map M-7.7.

The entrance to Poorfarm Cave is in an obscure sink in open woodland on the northeast side of a low hill at an elevation of 2360 ft. The cave consists mainly of two master trunks, strike-oriented, and roughly parallel. The entrance is a collapse into the northwest end of the lower passage. It is a smooth-walled passage, 10 ft high and 15–20 ft wide with a smooth clay floor. Six hundred feet from the entrance, an obscure side passage on the left connects with the Canyon, the other master trunk, near its northeast terminus in a large breakdown. The side passage continues and leads to a lower passage with an active stream, fed by several vertical shafts. The entrance passage continues for 800 ft as a 6–10-foot high, 30-foot wide trunk with alternating smooth floors and breakdown. It is interrupted by 500 ft of breakdown maze and then opens to another walkway. After another 600 ft the passage is again interrupted by breakdown where the canyon passage crosses above. After a final 800 ft, the entrance passage terminates in a breakdown plug.

The canyon passage heads southwest about 30 ft higher than the entrance passage. The first 1000 ft average is 50 ft wide and 20 ft high with some areas reaching ceiling heights of 60 ft. The floors alternate from smooth clay to breakdown. There is a 40-foot crawl where sediment has filled the passage almost to the ceiling. The canyon passage crosses the entrance passage with no interconnection. The passage ends in a tangle of small passages with active speleothem deposition.

The two passages that make up Poorfarm Cave are remnants of a paleodrainage system. At elevations above 2300 ft, the passages are well above the active drainage focused on Locust Spring. There are massive infills of clay, silt, and cobbles that demonstrate an active drainage from Droop Mountain in the past. Details of the sediments are given by Wolfe (1973). There are places in the cave where more recent processes have removed earlier sediment (Fig. 7.11). Speleothems occur in a few places, often interlayered with clastic sediments, with many now dry and inactive (Fig. 7.12).

Fig. 7.11 Travertine shelf overlying a fill bank that is now eroded away. Poorfarm Cave. Photo by W.B. White

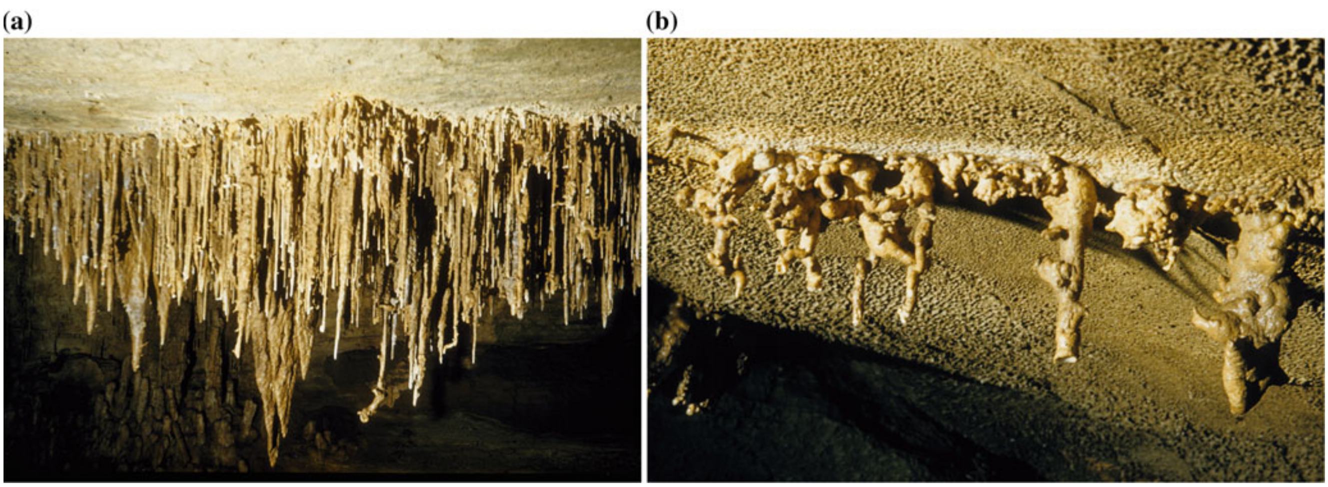


Fig. 7.12 Speleothems in Poorfarm Cave. **a** Erratic stalactites. **b** Helictites. Photos by W.B. White

7.7 The Hills Creek Drainage

The headwaters of Hills Creek are at the northeast end of a high valley in the Yew Mountains confusingly also called the Little Levels. The stream flows west with a low gradient for 2.5 miles parallel to highway 39. The stream then makes a turn to the southeast, drops precipitously over Hills Creek Falls and then follows a steep narrow valley until the gradient begins to flatten into a floodplain below Lobelia (Fig. 7.13). Hills Creek goes underground at the entrance to Hills Creek Cave on the west base of Droop Mountain at an elevation of 2450 ft. The lower reach of the Hills Creek basin is a blind valley requiring water depths of more than 100 ft in order to spill over into the irregular valley southwest along Droop Mountain. The usual interpretation is that the low gradient segment in the high valley was once a tributary of the Cherry River, pirated by Hills Creek when the higher gradient stream cut back into the mountains. A curious feature of Hills Creek is that it is essentially linear over the roughly six miles from the Hills Creek Falls to the cave entrance suggesting that the stream is following a lineament.

Bruffey Creek is a more conventional stream with multiple tributaries that head on the mountain flanks and converge into a single stream that sinks at the entrance to

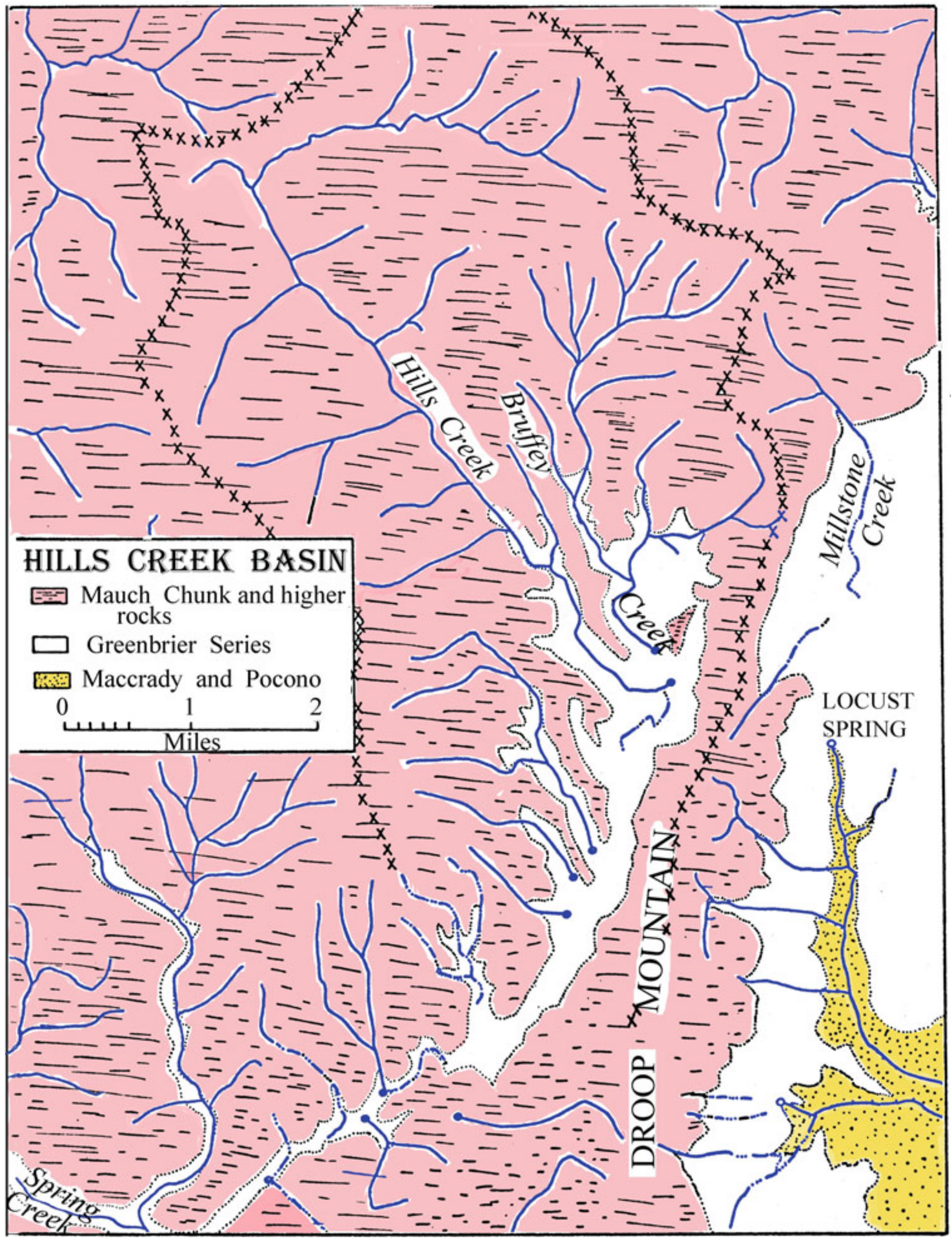


Fig. 7.13 Map of the Hills and Bruffey Creek basins

Bruffey Creek Cave (Fig. 7.14). There is a serious error on the Droop 7.5 min quadrangle. It shows Hills and Bruffey Creeks joining on the surface and ending in a spring. In reality, the two cave entrances are about 1200 ft apart.

7.7.1 Hills and Bruffey Creek Caves

The entrance to Bruffey Creek Cave opens into a 10–20 foot high and 15 ft wide passage that trends southeast for 500 ft to the junction with Hills Creek Cave. The entrance to Hills Creek Cave is often clogged with logs and other debris (electronic map M-7.8). Inside, the 8–20-foot high, 15-foot wide passage trends north for 200 ft to the junction with the Bruffey Creek passage. From the junction, the cave continues for several hundred feet as a 30-foot wide, 4–6-foot high passage filled with water to within inches of the ceiling. Finally the ceiling rises and the stream flows between gravel banks. The passage continues for about 2000 ft in a loop to the northeast and then to the south–southwest through two more pools. The stream passage bends sharply to the east at a large breakdown-filled section which appears to be following a fault. The steam sinks in its bed at the bend. No way through the breakdown has been found.

The details of the underground flow patterns in the Hills Creek Valley and the western edge of the Little Levels are

Fig. 7.14 Entrance to Bruffey Creek Cave. Photo by W.B. White

very complex, depend strongly on the magnitude of the discharge, and are not well understood. Under low-flow conditions, Bruffey Creek sinks in its bed upstream from the cave entrance and crosses under Droop Mountain to appear as the stream in Upper Hughes Creek Cave. This diversion path is likely perched on the Taggard Shale. Under low-flow conditions, Hills Creek sinks in its bed upstream from the entrance, flows to Cutlip Cave and from there southwest through the Friars Hole cave system (Chap. 8). Under moderate flow conditions both streams continue into the cave entrances so that a portion of the water goes directly to Locust Spring. Under high flow conditions, water backs up forming a lake in the blind valley which drains into Cutlip Cave and from there southwest down the Friars Hole System.

The gradient of the cave system is very low. The point where the stream is lost at the edge of the breakdown chamber is only about 30 ft below the cave entrance. A profile along Hills Creek and over Droop Mountain (Fig. 7.15) show the stream channel flattening out at about

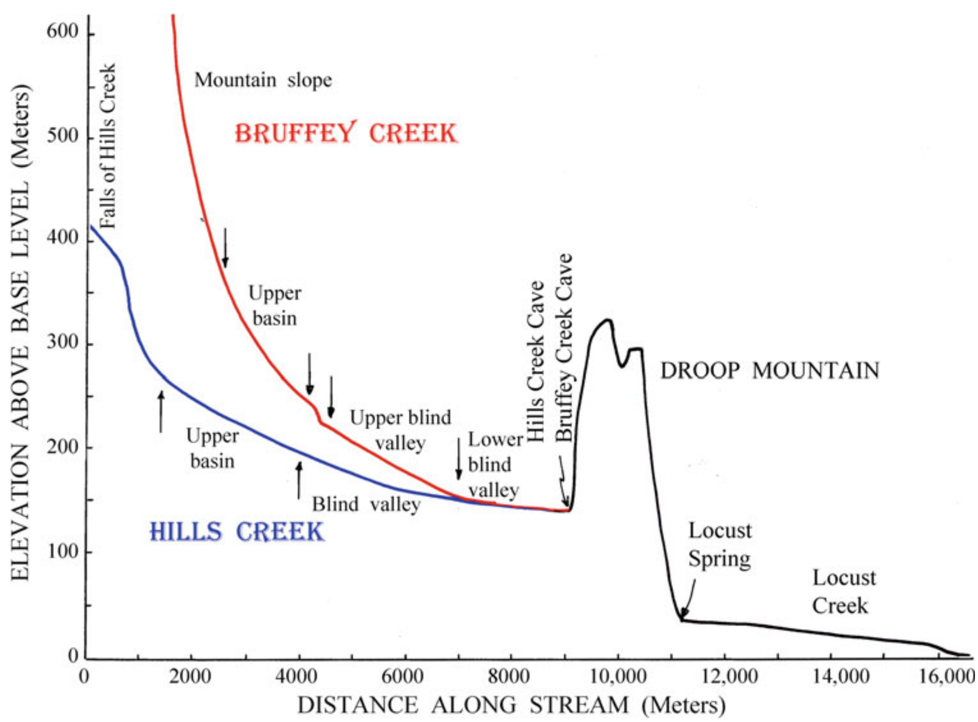


Fig. 7.15 Profile of Hills and Bruffey Creeks

2420 ft elevation at the final point of observation. Locust Spring is at an elevation of 2090 ft leaving a vertical offset of more than 300 ft to be explained. Between these points is the Taggard Shale acting as a confining layer and the unknown importance of the fault (or faults) that may be responsible for the extensive breakdown at the end of the Hills-Bruffey Creek system and at the upstream end of Upper Hughes Creek Cave (Medville and Medville 1991). Clearly there is something quite peculiar about the hydrology of the streams beneath Droop Mountain, unfortunately with access blocked by breakdown both up and down stream.

7.7.2 Martens Cave

Martens Cave is a fragment of master trunk conduit on the west side of Droop Mountain at an elevation of 2600 ft. The south entrance is a large hole in a 50-foot cliff in a large sinkhole. The north entrance is a wide opening in a low cliff about 300 ft linear distance from the south entrance. Between the entrances are about 500 ft of passage with widths up to 60 ft and ceiling heights of 10–30 ft (Fig. 7.16). A stream, Cave Run, flows through the cave from south to north. At the north entrance, the stream flows down a steep bank and joins Bruffey Creek. A breeze blows through the cave from south to north and was used by Davies (1960) for meteorological observations.

The reason for including this short cave in the discussion of the Little Levels is its unusual geographic and geologic setting. Martens Cave is in the Alderson Limestone with the stream perched on the Greenville Shale. The walls are smoothly but elaborately sculptured with many large ceiling pendants (Fig. 7.17). Passage shape and solution features indicate that Martens Cave was formed in the phreatic zone, by slowly percolating water along a flow path dictated by bedding plane partings between the Alderson Limestone and the Greenville Shale. This would require that the cave represents a time when base levels on the west side of Droop Mountain were well above 2600 ft, 500–600 ft above present day base levels.

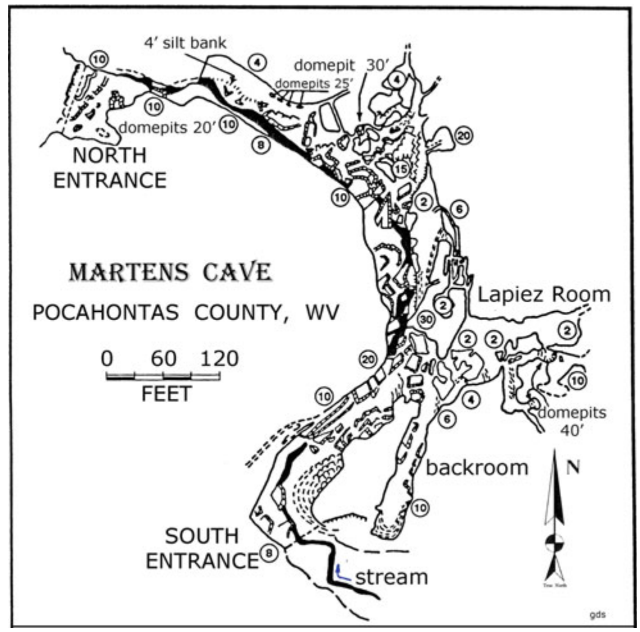


Fig. 7.16 Map of Martens Cave. From Storrick (1992)

Fig. 7.17 Giant pendant in Martens Cave. Photo by W.B. White

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