Map Unit Properties Table: Mammoth Cave National Park

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Age	Unit Name (Symbol)	Features and Description	Erosion Resistance	Suitability for Infrastructure	Hazards	Cultural Resources	Paleontological Resources	Karst	Mineral Occurrence	Habitat	Geologic Significance and Miscellaneous Notes
QUATERNARY	Artificial fill (*Qaf*) Alluvium (*Qal*) Landslide deposits (*Ql*)	*Qaf* is a mixture of imported material used for the construction of dams and other structures. *Qal* contains silt, clay, sand, and gravel inclusive of floodplain, channel, and alluvial-fan deposits along rivers and streams, as well as some colluvium on steep slopes and, locally, lacustrine clay and silt. *Ql* contains sandstone blocks in crushed shale and sandstone matrix, which collapsed due to instability within shale beds. *Qal* is mapped within the park.	Low	Units are associated with riparian areas and steep slopes, active floodplains, and impoundment features. These considerations should be taken into account when planning development. Wells dug in floodplain deposits can yield up to 1,900 liters (500 gallons) per day.	*Qal* may be prone to flooding, and slumping and erosion when exposed on a slope. *Ql* is formed during landslides and is prone to further mass movement.	Chert pebbles and cobbles may have provided tool material.	May contain modern remains.	*Ql* may be present in sinkholes.	Sand, gravel, silt, clay, ironstone pebbles, white quartzite pebbles, coal pebbles.	Riparian habitat flanking rivers and streams.	Units record modern land use, riparian evolution, and slope processes that constantly change the landscape at Mammoth Cave National Park.
QUATERNARY-TERTIARY	Terrace gravels (*QTg*) Terrace deposits (*QTt*) Brecciated and slumped sandstone (*QTb*)	*QTg* contains mostly gravel with a median grain size of 10 mm in a matrix of finer quartz sand and silt with minor amounts of clay. Unit is poorly to moderately sorted, unconsolidated, with some crossbedding. Some hydrous iron oxide-cemented lenses are present in lower layers. *QTt* contains gravel, sand, silt, and clay, and locally ranges from 5 to 17 m (16 to 56 ft) thick, approximately 15 to 35 m (49 to 115 ft) above the present floodplain level in some reaches. *QTb* contains slumped sandstone, conglomerate, and shale blocks in a matrix of sand, gravel, and clay.	Moderately high for gravel-rich layers	Deposits are present atop hills and slumped rock and on older erosional surfaces. Heterogeneous nature of unit may render it unstable if undercut on steep slopes. *QTb* is associated with active karst processes and should be avoided for infrastructure.	*QTg* forms resistant caps atop hills and may be prone to blockfall. *QTb* is prone to slumping and sliding into sinkholes.	None documented	Marine invertebrate fossils in bedrock pebbles, including corals, brachiopods, bryozoans, and crinoid columnals.	*QTb* is associated with active sinkhole development and slumps into solution cavities of underlying units.	Quartz pebbles, sand, silt, clay, ferruginous quartz conglomerate, hydrous iron oxide, jasper-like quartz, geodes.	Units support upland forests with well-drained soils.	Terrace gravels cap hills and are derived from Pennsylvanian rocks. Units are remnants of an ancient stream channel cut on Mississippian and Pennsylvanian rocks. *QTb* records the development of the karst landscape throughout the area, especially during the extensive Tertiary dissolution of the Mississippian limestone units along and below the unconformable contact at the base of *PNtc*.
MIDDLE-LOWER PENNSYLVANIAN	Tradewater and Caseyville formations (*PNtc*)	Lumped unit consists of interlayered conglomerate, sandstone, siltstone, coal, and shale. Most cobbles in the conglomerate are about 7.5 cm (3.0 in) in diameter and can be conspicuous white quartzite. Massive, crossbedded layers form cliffs regionally. Some asphalt-bearing zones occur locally. Colors range from light-reddish-brown, brown, and very-light-gray (conglomerate) to yellowish-brown and bluish-gray (sandstone and shale). *PNtc* is mapped within the park.	High	Unit is often undercut and exposed as cliffs. Avoid development on sloped or heavily fractured areas.	Unit is frequently covered with talus and colluvium resulting from active slope processes. Unit is prone to undercutting, cliff formation, and blockfall.	Unit may be part of large rock shelters, which may have contained American Indian habitation sites.	Root casts, stems	Unit forms cap rock over units of active karst formation.	Conglomerate, sandstone, iron-oxide nodules, coal.	Formation caps highest hills throughout the area and supports upland forests.	Unit forms the cap rock above soluble carbonate formations regionally. Unit contains the “Main Nolin” coal at prospects and mines locally.
MIDDLE PENNSYLVANIAN	Tradewater Formation (*PNt*)	Unit contains fine- to medium-grained, silty, friable, mica-rich, thick-bedded, crossbedded sandstone layered with sandy, silty, carbonaceous shale and limestone. Many coal beds are locally persistent throughout this unit (linear units: *PNls*, *PNc1*, *PNcu*, *PNmc*, *PNmca*, *PNmmcl*, *PNd*, *PNa*, *PNf*, and *PNam*). Many coal beds are underlain by several cm of gray underclay.	Moderately high	Unit is often undercut and exposed as cliffs. Avoid development on sloped or heavily fractured areas.	Unit is frequently covered with talus and colluvium resulting from active slope processes. Unit is prone to undercutting, cliff formation, and blockfall.	Prominent coal beds were mined from the late 1800s through most of the 1900s.	Unit contains fossiliferous limestone.	Limestone layers within this unit are prone to dissolution.	Coal, sandstone, limestone, iron-clay concretions.	Formation caps highest hills throughout the area and supports upland forests.	Unit contains Mining City, Mannington, Lewisport, Dunbar, Aberdeen, Foster, and Amos coal beds.

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LOWER PENNSYLVANIAN	Caseyville Formation (***PNca***)	Unit contains conglomerate, sandstone, siltstone, coal, and shale. Conglomerate has well-rounded quartz pebbles as large as 30 mm (1 in.) in diameter in a quartz-rich matrix. Sandstone is fine- to coarse-grained, thin- to thick-bedded, with local iron-oxide staining. Siltstone and shale are yellowish-brown with lenses of sandstone. Asphaltic conglomerate occurs in a 2- to 3–m- (6- to 9–ft-) thick basal zone locally. ***PNca*** is mapped within the park.	High	Wells into the sandstone in lower beds of this unit can produce up to 230 liters (60 gallons) of water per minute. Groundwater is rich in sodium bicarbonate. Unit is often undercut and exposed as cliffs. Avoid development on sloped or heavily fractured areas.	Unit is frequently covered with talus and colluvium resulting from active slope processes. Unit is prone to undercutting, cliff formation, and blockfall.	Prominent coal beds were mined from the late 1800s through most of the 1900s. Unit forms rock shelters that may have been inhabited. A steam boiler was used to extract asphalt from the unit to make “paint.”	Plant stem impressions, some plant remains	Unit forms cap rock over units of active karst formation.	Quartz pebbles, sandstone, shale, iron-oxide nodules, vein quartz, manganiferous cement, rock asphalt.	Formation caps highest hills throughout the area and supports upland forests.	Unit contains the Nolin coal bed. Unit marks a regional unconformity of Pennsylvanian rocks atop Mississippian rocks. Unit fills channels eroded into the upper surface of the Mississippian rocks.
UPPER MISSSSIPPIAN	Leitchfield Formation (***Ml***) Clore Limestone (***Mcl***) Palestine Sandstone (***Mpt***) Menard Limestone (***Mme***) Waltersburg Sandstone (***Mwl***)	***Ml*** contains clayey to silty, soft, thin-bedded shale interlayered with limestone, laminated siltstone, and fine- to medium-grained, massive sandstone. Shale appears green, gray, and red in outcrop and weathers to brown. ***Mcl*** consists of fine- to medium-grained limestone; clayey, calcareous, thinly parted shale; and thin-bedded, rippled sandstone. ***Mcl*** appears medium- to dark-gray in weathered outcrops. ***Mpt*** includes fine-grained, argillaceous sandstone; laminated siltstone; and clay-rich shale. ***Mpt*** appears yellowish-gray in fresh exposures and reddish-brown in weathered outcrops. ***Mme*** contains fine- to medium-grained, thin- to medium-bedded limestone and shale. Mme appears yellowish-gray in fresh exposures and weathers to orangish-gray. ***Mwl*** contains yellowish-gray, carbonaceous, clayey, locally marly, poorly exposed shale; very fine- to fine-grained, argillaceous, laminated sandstone; and thin beds of fine-grained limestone. ***Ml*** is mapped within the park.	Moderate	When water-saturated, clays within ***Ml*** become plastic and could be unstable as a foundation base.	Slabby- to blocky-weathering sandstone in ***Mpt*** may pose a rockfall hazard if undercut. ***Mme*** commonly forms ledges that may be prone to blockfall. ***Mwl*** weathers into rhombic-shaped blocks that may be prone to blockfall when exposed on a slope.	Some bedded and angular chert in ***Ml***, ***Mwl***, and ***Mme*** may have provided tool material.	***Ml*** has fossiliferous limestone with crinoids. ***Mcl*** has fossiliferous layers in upper portions of the limestone beds with numerous brachiopods. ***Mme*** contains oolites, bryozoans, gastropods, and crinoid, brachiopod, and blastoid fragments.	***Ml*** has a conspicuous limestone layer (Vienna Limestone) that could be prone to dissolution. Discontinuous, relatively thin limestones could be prone to local dissolution.	Shale, sandstone, siltstone, limestone.	***Ml*** forms subdued topography and weathers to a clay-rich soil.	***Mme*** contains the ***Mmels*** limestone marker bed. Units form the uppermost (youngest) Mississippian geologic record beneath a regional unconformity.
	Vienna Limestone (***Mv***) Tar Springs Sandstone (***Mts***) Glen Dean Limestone (***Mgd***) Hardinsburg Sandstone (***Mh***)	***Mv*** contains finely crystalline to coarse-grained, dense, locally argillaceous or dolomitic, laminated to thick-bedded limestone. Unit appears dark-brownish-gray in fresh exposures and weathers to a lighter olive-gray. ***Mts*** contains interbedded silty, calcareous shale; very fine- to fine-grained, crossbedded, iron-stained sandstone; laminated and nodular siltstone; and fine- to medium-grained, argillaceous, thin-bedded, locally coarsely crystalline limestone. ***Mgd*** contains finely to coarsely crystalline, locally argillaceous, thin-bedded to massive limestone; and clayey to silty, calcareous, greenish-gray, laminated shale. ***Mh*** consists of medium-grained, crossbedded, iron-stained sandstone; and silty, fissile shale. ***Mgd*** and ***Mh*** are mapped within the park.	Moderately high, lower for weakly cemented layers in ***Mh***	***Mts*** is characterized by rapid lithological changes that render its physical properties spatially variable. Dissolution of underlying units has made weathered ***Mh*** exposures locally unstable, contorted, and slabby.	***Mv*** commonly forms narrow ledges that may slough off, causing blockfall along streams. Heterogeneous layering in ***Mts*** could render the unit unstable on steep slopes. Upper beds of ***Mgd*** commonly weather to rubble and may be prone to slope processes.	Abundant chert in ***Mv*** and ***Mgd*** may have provided tool material. Limestone was locally quarried from ***Mgd***.	Units contain brachiopods, crinoid stems, horn corals, blastoids, and bryozoans, including *Archimedes*. Abundant casts in ***Mgd***.	***Mv*** dissolves into vuggy or highly porous outcrops. Massive limestone beds in ***Mgd*** could be prone to karst processes.	Limestone, chert, sandstone, shale, siltstone, limonite pebbles.	Vugs in ***Mv*** may provide burrow habitat. ***Mh*** may weather to form clayey, sand-rich soils in upland areas.	Chert layers (with angular fragments) in ***Mv*** form distinctive marker beds. ***Mts*** and ***Mv*** interfinger with ***Ml*** and are sometimes considered equivalent to or members of ***Ml***. The base of ***Mh*** has been lowered approximately 6 m (20 ft) due to the dissolution of underlying limestone units.

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UPPER MISSSIPPIAN	Golconda Formation: Haney Limestone Member (***Mgh***) Big Clifty Sandstone Member (***Mgb***) Beech Creek Limestone Member (***Mgc***)	***Mgh*** comprises fine- to coarse-grained, crystalline, massive, fossiliferous, and partly oolitic limestone; and calcareous, laminated shale. ***Mgb*** consists of fine- to medium-grained sandstone, scattered lenses of dark-gray siltstone, and fissile shale. ***Mgc*** contains finely crystalline to fossil fragmental, hard, medium- to thick-bedded limestone; and calcareous, thin-bedded shale ***Mgh*** and ***Mgb*** are mapped within the park.	Moderate to moderately high for dense limestone cliff-forming units	***Mgh*** is highly soluble and not suitable for most development. Heavy development on ***Mgb*** should be avoided where it forms steep ledges and cliffs or is highly fractured. ***Mgc*** is highly vertically jointed and is unsuitable for wastewater treatment facilities.	***Mgh*** is associated with active dissolution and karst processes. It can form cliff exposures and contains slumped blocks of ***Mh***; it could be prone to further slope processes. ***Mgb*** is prone to blockfall along cliff exposures. ***Mgb*** readily forms abundant talus slopes.	Dense gray chert in ***Mgh*** may have provided tool material. Local coal lenses within ***Mgb*** were mined for private use. Overhanging cliffs of ***Mgb*** may have provided temporary shelters for American Indians. ***Mgb*** contains asphalt resources.	Crinoid stems, blastoids, bryozoans, carbonized plant fragments, pelecypod casts, horn corals, the fenestrate bryozoans *Archimedes*, gastropods, brachiopod *Inflatia inflata*.	***Mgh*** is very soluble and prone to solution-cavity formation. ***Mgc*** is also prone to karst dissolution, especially along vertical fractures.	Limestone, sparry calcite, ***Mgb*** contains asphaltic sandstone.	Numerous karst springs form at base of ***Mgh***. ***Mgh*** weathers to reddish-brown, clayey soil with abundant residuum. Springs are common atop shale layers within ***Mgb***.	The *Inflatia inflata*-rich layer in ***Mgc*** is an excellent stratigraphic marker in the Mississippian units. Golconda Formation may be included in the upper part of ***Mg***.
	Girkin Limestone (***Mg***) Reelsville Limestone (***Mr***) Sample Sandstone (***Msa***) Beaver Bend, Mooretown Formation, and Paoli Limestone (***Mbp***)	***Mg*** contains fine- to coarse-grained, crystalline, medium- to thick-bedded, locally crossbedded limestone. Some shale and sandstone interbeds are present locally and often separate the limestone into an upper fossiliferous and lower oolitic layers. Limestone ranges in color from medium-light-gray, brownish-gray, to mottled gray and white and weathers to orangish- or yellowish-brown. Shale is typically greenish. ***Mr*** contains finely crystalline to fine-grained fossil fragmental, dense, thin- to medium-bedded, oolitic limestone; and shale. ***Msa*** contains fine-grained, rippled, quartz-rich sandstone interbedded with silty, laminated shale. ***Mbp*** consists of fine- to medium-grained, well-sorted, thick-bedded, weathered sandstone; and very fine- to medium-grained, thin- to thick-bedded, oolitic, locally argillaceous limestone. ***Mg*** is mapped within the park.	Moderately high for resistant, hard limestones, moderately low for poorly cemented, weathered sandstone	Due to highly soluble nature and degree of limestone dissolution within these units, development requires detailed knowledge of subsurface structures. Deeply weathered ***Mbp*** may be unsuitable for structural foundations.	***Mg*** is associated with karst-related hazards, such as sinkhole collapse and cave-ins. Upper portion of ***Mr*** forms prominent ledges where exposed and may pose blockfall hazards. Clay-rich layers in ***Msa*** may become local slip surfaces. ***Mbp*** forms thin ledges on steep slopes and is prone to slumping.	Limestone was quarried from ***Mg*** and ***Mbp*** for local road material. ***Mg*** hosts caves that have been used throughout the region's history, including portions of Mammoth Cave. Chert may have provided tool material. ***Mg*** contains asphalt resources.	Stems of *Platycrinites* crinoid are an index fossil in ***Mg***; brachiopods including *Inflatia inflata*, *Talarocrinus* sp. calyxes, echinoids, coral colonies, blastoid *Pentrimites*.	***Mg*** is considered karstic, forming deep sinks, caves, and vertical shafts. The upper reaches of Mammoth Cave are within ***Mg***.	Limestone, calcite-lined vugs, geodes, quartz rosettes, fluorite, asphalt-bearing stylolites in ***Mg***, colored chert, pyritic inclusions, sandstone.	Caves and other solutional cavities provide habitat for bats and burrowing animals.	***Mg*** hosts numerous caves throughout the area. ***Mg*** has several types of limestone, including calcarenite, calculite, oolitic, and argillaceous. ***Mg*** is sometimes divided into Upper, Middle, and Lower members (***Mgu***, ***Mgm***, and ***Mgl***). ***Mbp*** rests on deeply weathered residuum of ***Msl*** and occupies a well-defined channel cut into rocks overlying ***Msl***.
	Ste. Genevieve Limestone (***Msg***) Lost River Chert (***Mls***)	***Msg*** comprises very fine- to medium-grained, thick-bedded, crossbedded limestone; and very fine-grained, massive, calcareous dolomite. Different compositions of limestone and dolomite are interlayered. ***Msg*** appears gray, tan, and buff in fresh exposures, with more brownish weathering on smooth, rounded surfaces. ***Mlr*** contains very fine-grained, resistant, chert-rich limestone. Chert weathers from yellowish-gray, to angular, reddish-gray. Chert blocks average around 30 cm (12 in) thick. ***Msg*** is mapped within the park.	Moderately high	Soluble, cave-forming nature of ***Msg*** makes it an unsuitable target for most development. ***Mlr*** forms resistant ledges that may fail when undercut by dissolving underlying limestone units.	Units are associated with active karst processes. Presence of slumped sandstone within sinkholes attests to slope processes.	***Msg*** is a primary cave-forming unit. It was quarried locally for road material, aggregate, and agricultural lime. Chert may have provided tool material. Caves have been used throughout the region's history.	Echinoids, crinoids (*Platycrinites*), blastoids, solitary corals, brachiopods, bryozoans, straw-like coral *Lithostrotion (Siphonoden-dron) genevievensis*, coral *Schoenophyllum aggregatum*, fenestrate bryozoans.	***Msg*** is very karstic with numerous caves, including the middle sections of Mammoth Cave, and sinkholes. Unit forms large, complex sinkholes called "uvalas" and sinkhole plains.	Calcite-filled vugs, limestone, dolomite, chert blocks, geodes.	Cave habitats, vugs for burrowing animals. ***Msg*** weathers to produce reddish-brown, clay-rich residuum.	***Msg*** contains the Lost River Chert (of Elrod [1899]) and numerous types of limestone, including oolitic, brecciated, calcarenite, calcilutite. ***Mlr*** occurs at the contact between ***Msg*** and ***Msl*** and appears as a resistant ledge between the two.

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UPPER MISSISSIPPIAN	St. Louis Limestone (***Msl***) Salem and Warsaw limestones (***Msw***) Salem Limestone (***Ms***) Harrodsburg Limestone (***Mhb***)	***Msl*** contains interbedded fine- to medium-grained, silty, locally carbonaceous, siliceous, thin- to thick-bedded limestone; argillaceous dolomite; sandstone; siltstone; and greenish-gray shale. ***Msl*** appears mostly gray to dark-gray on fresh and weathered surfaces. Chert in ***Msl*** occurs in beds, stringers, and nodules and weathers to white, cream, and reddish-brown. ***Msw*** consists of fine- to coarse-grained, thin-bedded to massive limestone; argillaceous dolomite; and argillaceous, calcareous, dolomitic siltstone. ***Ms*** contains coarse- and fine-grained limestone. The former is light-olive-gray with local crossbeds and abundant fossils, whereas the latter is yellowish-gray, silty, and clay-rich with interlayered silty, fissile shale. Other components in ***Ms*** include very fine-grained, thick-bedded dolomite and dolomitic siltstone. ***Mhb*** contains coarse- to very coarse-grained, thin- to thick-bedded, crossbedded, styloltic limestone with some silty, dolomitic interbeds present locally. Unit can appear homogenous in outcrop as massive, light- to yellowish-gray beds. ***Msl, Mhb,*** and ***Ms*** are mapped within the park.	Moderately high	Locally, ***Msl*** is exposed primarily in steep-walled sinkholes and should be avoided for infrastructure. Excavations into this unit may encounter large cavities.	***Msl*** forms steep-walled sinkholes and is subject to collapse and slumping.	***Msl*** is mostly exposed in steep-walled sinks, but forms caves. ***Msl*** has been quarried. Chert may have been used for tool material.	***Msl*** contains nodules with diagnostic fossils of corals *Lithostrotion proliferum* and *Lithostrotionella castelnaui*, brachiopod fragments, colonial coral *Arcocyathus*, blastoids, horn coral *Hapsiphyllum* in ***Msw***, brachiopod *Spirifer lateralis*, ***Ms*** contains trilobites, echinoid plates.	Msl is karstic and hosts caves, sinkholes, and forms karst landforms. Lower portions of Mammoth Cave are within this ***Msl***. ***Mhb*** contains sinkholes.	Calcite-filled vugs, limestone, dolomite, sandstone, shale, chert, oolite, geodes, gypsum, glauconite.	Vugs may provide burrow habitat. Much of ***Msl*** is weathered and covered with thick, residual soil. Springs are common at the base of ***Mhb***.	***Msl*** contains several different types of limestone with a gradational lower contact. ***Msw*** has limestone with various secondary components, including silt, sand, and oolites. ***Msw*** interfingers with underlying ***Mfp*** locally. Lower contact of ***Mhb*** is sharp, except where it overlays bioclastic limestone of ***Mbm***.
LOWER MISSISSIPPIAN	Fort Payne Formation (***Mfp***) Reef limestone of Fort Payne Formation (***Mfprl***)	***Mfp*** consists of light-gray or brown interbedded argillaceous, dolomitic, fine-grained, thin- to medium-bedded siltstone; argillaceous, dolomitic, fine- to very coarse-grained limestone; dolomitic fissile shale; claystone; chert; and argillaceous, silty, laminated dolomite. Thickness of formation ranges from 100 to 107 m (328 to 351 ft). ***Mfprl*** contains medium- to very coarse-grained, detrital, siliceous, cherty, glauconitic, fossiliferous, medium- to thick-bedded, crossbedded limestone with shale interbeds. Thickness of this member can reach 90 m (295 ft) locally.	Moderate	Units are suitable for most infrastructure unless highly weathered, dissolved, or fractured. Units may be prone to blockfall if exposed on steep slopes.	Claystone at the base of ***Mfp*** crumbles and disintegrates ("slakes") on contact with air and can be plastic when water–saturated; it is thus locally unstable.	Chert in ***Mfp*** may have provided tool material. Lower members of ***Mfp*** (reef limestone, unit ***Mfprl***) are known to produce oil.	Brachiopods, blastoids, bryozoans, echinoderms, crinoid stem fragments, trilobites. ***Mfprl*** contains crinoids, brachiopods, bryozoans, and fossil reefs.	Limestone units are prone to karst dissolution.	Disseminated geodes filled with quartz, calcite, barite, and gypsum; pyrite; limestone; sandstone; glauconite; phosphatic nodules.	Units weather to produce red residual soils.	***Mfp*** is a widespread unit recording conditions during the Mississippian. ***Mfprl*** is an oil-producing unit and contains the Cane Valley Member.
	Borden Formation: (***Mb***) Muldraugh Member (***Mbm***) Crinoidal limestone (***Mbls***)	***Mb*** consists of clayey, silty, irregularly bedded shale; thick-bedded, massive, brownish-gray, quartzose siltstone; and silty, thin- to thick-bedded, light-olive-gray dolomitic limestone. ***Mbm*** contains dolomitic, calcareous, yellowish-gray, micaceous siltstone interlayered with very fine-grained, calcareous, silty, and argillaceous dolomite; fine- to very fine-grained, crossbedded sandstone; and dolomitic, siliceous, sandy, silty, thin-bedded limestone. ***Mbls*** contains fine- to coarse-grained, fossiliferous limestone in thin- to thick-bedded, crossbedded lenses interlayered with siltstone. ***Mbm*** is mapped within the park.	Moderate	***Mb*** tends to form steep slopes (Muldraugh Escarpment) and steeply plunging gullies. Given the propensity for landslides, this unit should probably be avoided for most infrastructure.	Shale in ***Mb*** becomes plastic when wet and is very prone to landslides.	Chert nodules and lenses in ***Mbm*** may have provided tool material.	Crinoid columnals, fossiliferous limestone, bryozoans and brachiopod fragments.	Thick-bedded layers of limestone may be susceptible to dissolution.	Limestone, ironstone concretions, phosphatic nodules, quartz-lined geodes, glauconite, pyrite nodules, chert.	Units form steep slopes and gullies.	***Mb*** contains seven members in ascending order: New Providence Shale, Nancy, Cowbell, Halls Gap, Wildie, Nada, and Muldraugh members. ***Mbls*** resembles reef-like deposits in south-central Kentucky.
UPPER-MIDDLE DEVONIAN	Chattanooga Shale (***Dc***)	***Dc*** contains fissile, carbonaceous, silty, thinly laminated, dark, brownish-black, bituminous shale. Quartzose, fine- to coarse-grained, poorly sorted sandstone occurs in lower portions of the unit.	Moderately low	***Dc*** contains uranium in places and may pose a radon hazard for basements.	Shale is fissile to slabby and can be unstable when exposed on slopes. ***Dc*** is the primary source of the radon gas that accumulates in the caves.	Devonian units tapped for "Corniferous" or lowermost Devonian-age oil shows.	Brachiopods, fish scales, worm tracks, fish teeth, conodonts.	No karst dissolution associated with this unit.	Shale, sandstone, marcasite nodules, cubic pyrite, phosphatic concretions, sulfur, iron oxide.	Weathers to a thick reddish-yellow soil.	***Dc*** is a widespread unit recording marine conditions during the Devonian.

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MIDDLE-LOWER DEVONIAN	Sellersburg and Jeffersonville limestones (***Dsj***)	***Dsj*** consists of fine- to coarse-grained, partially recrystallized, thick-bedded limestone; and silty, argillaceous, medium- to dark-gray dolomite.	Moderate	Unit is locally limited in exposure.	Unit could be prone to karst dissolution.	None documented	Crinoid stems, horn (rugose) corals (*Hapsiphyllum, Eridophyllum)*, colonial corals (*Favosites*).	Karst dissolution is possible in these carbonate-rich units	Limestone, prismatic dolomite crystals, marcasite laminae and nodules.	None documented	***Dsj*** rests unconformably on the Laurel Dolomite (***Slwl***).
MIDDLE SILURIAN	Louisville Limestone, Waldron Shale, and Laurel Dolomite (***Slwl***)	***Slwl*** contains three units in ascending order: Laurel Dolomite, Waldron Shale, and Louisville Limestone. The Laurel Dolomite and Louisville Limestone are lithologically similar, composed of fine- to medium-grained, greenish- to yellowish-gray, thick-bedded, mottled dolomite. Dolomite units are separated by the Waldron Shale, a medium- to thick-bedded, blocky, silty, fissile, dolomitic shale.	Moderate to moderately high for Waldron Shale	Avoid development on heavily fractured and weathered exposures.	Units may be prone to blockfall, especially where shale ledges are exposed over dissolved limestone.	Laurel dolomite has a “blue sand” horizon known to produce oil in local wells.	Crinoids, brachiopod valves (*Pentamerus oblongus*).	Dolomite and limestone prone to dissolution, primarily small-scale.	Dolomite, limestone, calcite crystals, pyrite, nodular aggregates of dolomite crystals.	Waldron Shale forms ledges that could provide nesting and den habitat. Dolomite is vuggy and could provide cache locations or burrows.	Units are gradational and record relatively continuous deposition.