Map Unit Properties Table

Age	Unit Name (Symbol)	Features and Description	Erosion Resistance	Suitability for Development	Hazards	Potential Paleontologic Resources	Potential Cultural Resources	Potential for Karst	Mineral Resources & Specimens	Habitat	Recreation Potential	Global Significance
	Artificial fill (af)	Man- made fill deposits, mostly for dams and highways										
Quaternary	Alluvium (Qal), alluvial-terrace deposits (Qal1), sheet wash alluvium (Qac), colluvium (Qc), Volcanic gravel colluvium (Qcv), peat (Qo), eolian deposits (Qes), landslide deposits (Qms), alluvial fan deposits (Qf), older talus and colluvium (Qmt2), older alluvium (Qa), and older landslide deposits (QTl)	Unconsolidated sediments deposited in eolian, alluvial, fan, and landslides; includes peat deposits. Pleistocene and Holocene landslide deposits (Qms), colluvium (Qc), alluvial fans (Qf), and alluvium (Qal) are common in CEBR (Hatfield et al., 2000). Landslides in the Brian Head Formation are especially common. Alpine Pond fills a depression formed by a landslide, and about 50 feet of Isom Fm. blocks are exposed along the landslide scarp above the pond. Peat (Qo) has formed from Pleistocene and Holocene bog deposits that occur in and near the monument. Vegetation has stabilized eolian dunes (Qes) just east of the Cedar Breaks rim (Hatfield et al., 2000).	Low to very low	Units are suitable for most development unless exposed on a slope where unconsolidated deposits are prone to fail. High permeability of units makes some waste facility development problematic. Presence of any altered volcanics (as swelling clays) may make road and trail development risky.	High landslide potential as well as mass wasting and other slumping, especially when units are water saturated.	Local fossil remains; many likely washed in from other units	Tools, arrowheads and other artifacts	None	Sand and gravel	Forms valley fill throughout monument	Suitable for most recreation including hiking, biking, camping	Quaternary peat deposits
Quaternary	Basalt (Qb), and olivine-plagioclase mafic volcanic rock: lava flows (Qbf1)	Black & gray, vesicular, generally crystalline poor, basalt. Some units with visible crystals of olivine and plagioclase present as lava flows. Resistant basalt forms lava flows, flow breccia, dikes, and cinder cones just east of CEBR; vegetated flows probably Pleistocene in age; those without vegetation may be Holocene.	Moderate to high	Units are suitable for most development unless high fracture density is present. Any altered clays. associated with the volcanics may lead to unstable road, trail, and building foundations.	Rockfall potential when exposed on a cliff face.	None	None documented	None	Olivine plagioclase and clinopyroxene phenocrysts	Vugs and vesicles, if large enough, can provide habitat	Suitable for most recreation.	Potential for data modern volcanics
Tertiary (Miocene)	Markagunt Megabreccia (Tm)	Angular clasts and broken masses of Brian Head, Wah Wah Springs (not in CEBR), Isom, Bear Valley (not in CEBR), and Mount Dutton (not in CEBR) Formations form the poorly exposed, structurally chaotic assemblage of Markagunt Megabreccia; rock masses, house- to city-block- sized, set in a matrix of sheared and folded rocks of same units. Some masses are as large as 1 square mile. 20- 46 m (65-150 ft) thick.	Low	Most permanent development on this unit is not recommended due to the highly fractured nature of the breccia.	Rockfall and landslide potential high; highly fractured and deformed unit.	Fragments from other units	None documented	None	Boulders and other landscaping materials; Fascinating deformed rock	Fractured nature of unit lends to many cavities for nests and burrows	Recreation not recommended due to deformed nature of unit	Large gravity slide deposits, type locality
Tertiary (Miocene)	Leach Canyon Formation (Tl)	The distinctive, rhyolite ash- flow tuffs of Miocene age (23.8 Ma); cooling units may be associated with the Caliente caldera complex straddling Nevada- Utah border about 60 miles to the west. Leach Canyon tuffs did not extend past eastern section of the Markagunt Plateau. Phenocrysts make up about 10 to 20 % of the crystal- poor tuff; ubiquitous brownish- red rhyolite lithic clasts, rounded gas cavities lined with yellow vapor- phase minerals, and abundant white collapsed pumice fragments; 26 m (85 ft) thick.	Moderate	Poorly welded; friable and weak for road & buildings foundations, trails and camp sites; variable permeability may allow waste facility development.	Highly friable; easily eroded; slides and slumping probable.	None	None documented	None	Zeolite minerals in vugs, tuffs; volcanic glass; pumice and other volcanic rocks	Vugs and vesicles if large enough can provide habitat	Suitable for most recreation except rock climbing and other types dependent on slope stability	23.8 Ma tuff layer

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Tertiary (Oligocene)	Isom Formation (Ti)	Three members: the Blue Meadows Tuff member, Baldhills Tuff member (may be 650 feet thick), and Hole- in- the- Wall Tuff member. North of CEBR, Baldhills Tuff member forms at least three cooling units totaling about 80 feet thick; units consist of dark- gray, black, and brick red tuff with long linear vesicles and local breccia; formation generally composed of resistant, reddish- brown to dark- gray, crystal- poor, densely welded, trachytic ash- flow tuffs; 24 m (80+ ft) thick	Moderate to high	Poorly welded; friable and weak for road & buildings foundations, trails and camp sites; variable permeability may allow waste facility development.	Degree of welding highly heterogeneous; erosion, slides and slumping probable.	None	None documented	None	Volcanic landscaping rocks Ash flow tuffs; breccia locally present	Vugs and vesicles, if large, enough can provide habitat	Suitable for most recreation	27- 26 Ma tuff layer
Tertiary (U. Eocene – Oligocene)	Brian Head Formation (Tbh)	Three poorly exposed units: 1) lower soft, reddish- brown, pink, & reddish- orange, non- tuffaceous sandstone & conglomerate with some siltstone, claystone, & micritic limestone; 2) gray, greenish- gray, yellowish- gray, bioturbated beds of volcaniclastic clayey sandstone, conglomeratic sandstone, claystone, micritic limestone, & air fall tuff; 3) upper heterogeneous unit of volcanic mudflow breccia, immature volcanic sandstone and conglomerate, mafic lava flows, and ash- flow tuff; total thickness: 213 m (700 ft).	Moderate	Variable in rock type, degree of consolidation and stability; careful mapping and surveying recommended before development; some swelling clay.	High potential for rockfalls and landslides especially when exposed on a slope or undercut by erosion of underlying layers	Vertebrates Plants	Chert may have provided tool material in this unit	None	Flagstone, building material, chalcedony root casts	None documented	Suitable for most recreation	Possibly a type section in monument
Tertiary (Eocene)	Claron Formation, White Member (Tcw)	Lake & river sediments; cliff of white & light- orange, micritic limestone; yellowish- gray to light- brown, interbedded mudstone and fine- to medium- grained sandstone; cliff of white, light- yellowish- gray, and light- orange, micritic limestone; forms impressive, west- facing scarp marking the rim of the central Markagunt Plateau; about 110 m (360 ft) thick.	Moderate	Hoodoos and other erosional and karst features are abundant in this unit making development a poor candidate for development.	Slumping, sliding and rockfall potential when highly eroded or undercut from lower units on a slope face	Locally abundant palynomorphs, insects and assorted gastropods	Erosional formations often had spiritual significance to ancient Native American tribes	High	Limestone Some sparry calcite and chalcedony	Hoodoos and other erosional features create cavities and cliffs for habitat	Erodibility and delicate nature of hoodoos discourages recreational use	Type section potential
Tertiary (Paleocene - Eocene)	Claron Formation, Red Member (Tcr)	Resistant pink, red, & reddish- orange, argillaceous, sandy micritic limestone; resistant reddish- tan & pink cross- bedded sandstone; soft, red and pink silty mudstone with minor lenticular, gray, pink, reddish- tan, resistant conglomerate and conglomeratic sandstone; 65- foot limestone at base. Thin- bedded limestone, cross- bedded sandstone, and lenticular conglomerate beds are more resistant than soft mudstone beds; veinlets of sparry calcite that represent algal filaments branch through the limestone also containing vertical burrow fillings and stylolites. Shallow caves and local springs found in 65- foot limestone bed at base; approximately 396 m (1300 ft) thick.	Moderate	Hoodoos and other erosional and karst features abundant; a poor candidate for development.	Severe erosion hazards; landslide potential rockfall potential, especially where exposed on steep slopes	Pelecypods, gastropods and other trace fossils abundant.	Hoodoos and other erosional formations had significant spiritual significance to local ancient Native American peoples	High	Limestone Caliche beds	Hoodoos and other erosional features create cavities and cliffs for habitat	Erodibility and delicate nature of hoodoos discourages recreational use	Type section potential

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Upper Cretaceous –Tertiary (Paleocene)	Grand Castle and Wahweap Sandstones (TKgw)	Mostly sandstone in upper part of Wahweap; rest of formation poorly exposed, interbedded soft, mostly brownish- gray, olive- brown, and reddish- brown mudstone with minor sandstone and siltstone. Thin- bedded siltstone and fine- grained sandstone is gray, black, and grayish- orange; sandstone locally cross- bedded (Hatfield et al., 2000). Carbonized fossil wood, leaf impressions, and spherical calcareous, limonitic concretions present; lower part of the unit is a poorly exposed friable, cross- bedded sandstone; light gray to light yellowish- gray and locally interbedded with underlying Wahweap Sandstone; upper part is a ledge of fine- to coarse- grained, cross- bedded, argillaceous, cherty sandstone and small- pebble mudstone conglomerate. The angular, poorly to moderately sorted sandstone is yellowish- brown, orange- gray, and white "salt- and- pepper;" may correlate with Grand Castle Fm.; combined thickness averages 305 m (1000+ ft).	Moderate to high	Suitable for most forms of development unless highly fractured or undercut on a slope; variable in rock type; careful mapping and development needed; mud- rich units & poorly consolidated units will compromise stability of structures and roads.	High variability of rock types may create rockfalls when a resistant unit overlies a less resistant unit; sliding potential in mud- rich or poorly consolidated layers.	Leaf impressions, some fossil wood, pelecypods and other assorted vertebrate fossils found regionally	Possible tool material	Low; little carbonate present	Limonite, pyrite concretions, flagstone material	Vugs in cliffs may provide nesting habitat	Suitable for most forms of recreation unless poorly cemented on slopes	Controversy over origin and designation of unit
Upper Cretaceous	Straight Cliffs Formation, upper part (Kscu)	Soft, light- gray, yellowish- gray, light yellowish- brown, reddish- brown, & brownish- gray mudstone with thin beds of lenticular, fine- to medium- grained sandstone; sandstone thickens to west where lower unit forms gray cliffs of marine sandstone interbedded with thin beds of fossiliferous oyster- bearing limestone and coal; oyster- bearing limestone and coal to the west of CEBR; about 366 m (1200 ft) thick.	High	Suitable for most forms of development unless highly fractured or undercut on a slope exposure.	Rockfall potential when exposed on a cliff face	Some fossil wood, oysters, clams and assorted gastropods	Provided building material for ancient Native Americans; petroglyphs present at some locales	Low; little carbonate present	Coal beds	Vugs in cliffs may provide nesting habitat	Suitable for most forms of recreation unless on slope forming uppermost beds; climbing discouraged in upper parts of unit	Correlated with Iron Springs Formation of the Basin and Range