

# Map Unit Properties Table

Age	Map Unit (symbol)	Unit Description	Topographic Expression	Resistance to Erosion	Paleontological Resources	Hazards	Mineral Resources	Cultural Resources	Other	
Quaternary (Holocene)	Alluvium (Qal)	Heterogeneous mixture of clay, silt, sand, and gravel; local organic-rich layers (Tantalus Creek) of peat; coarse gravel forms lenses and channel fill with gently dipping cross-laminations; sandy alluvium forms thin, regular beds with steeply dipping cross-laminations; evenly bedded silty alluvium; thickness ranges from 3-12 m (10-40 ft)	Flat lowlands bordering streams; alluvial fans (fan-shaped aprons) at mouth of canyons	Variable – silt more easily eroded than boulders	Mammoth, goat, musk ox, sloth, fragile snail shells; skull of bighorn sheep, elk antler, deer jawbone	Possible debris flows in flash floods	Thin layers of peat	Charcoal; stone points	N/A	
	Rock glacier deposits (Qmr)	Boulder deposits near the summits of Boulder Mountain and Mt. Pennell	Boulder slopes	High	None	Rock slippage	Unknown	Unknown	N/A	
	Eolian deposits (Qed)	Windblown sand, fine to medium grained; limited aerial extent	Small dunes	Low	None	None	None	Unknown	N/A	
	Colluvial deposits (Qms)	Includes rockslides, slumps and talus slopes consisting of a mixture of boulders, gravel, sand, and silt; thickness ranges from 0-6 m (0-20 ft)	Talus slopes	High if disturbed	None	None	Low	None	Unknown	N/A
	Terrace gravel deposits (Qat)	Boulders, gravel, sand, and silt; includes glacial outwash and pediment gravels; cross-laminations & horizontal bedding	Form terraces above current streams	Variable	Unknown	None	Low	None	Unknown	N/A
Quaternary (Pleistocene)	Glacial till (Qgt)	Unstratified mixture of unsorted angular boulders, gravel and sand; boulders are 0.3 to 1 m (1-3 ft) in length (one over 9 m, 30 ft, in length); locally up to at least 60 m (200 ft) thick; includes some glacial outwash deposits which overlie the till; probably deposited about 12,000 BP.	Moraines along Donkey, Fish, Carcass, Pleasant, Oak, East Boulder, West Boulder, Miller Creeks; irregular knobs; kettle depressions	Variable	None	Low	None documented	Unknown	Remnants of the only highland in Utah (Aquarius Plateau) to have been covered by an ice cap during Pleistocene glaciation.	
	Boulder deposits (Qnb)	Diverse mixture of soil and boulders that generally mantle the upper slopes of Thousand Lake and Boulder mountains; includes undifferentiated glacial landslide and alluvial deposits	Mouths of Fish and Carcass Creeks; near Browns Reservoir; Tantalus Flats along Pleasant Creek	High	None	Rock slippage	None	Unknown	N/A	
	Pediment gravels (Qap)	Volcanic boulders, cobbles, sand, and gravel; round to oblong volcanic boulders are 0.9 to 1.5 m (3-5 ft) in the long direction (some more than 4.5 m, 15 ft, in length); lenticular beds of gravel between 6 to 15 m (20-50 ft) thick; dissection of pediment surfaces suggest deposition at more than 75,000 years BP	Cap flat-topped hills and benches in Capitol Reef; on gently sloping surfaces several hundred feet above adjacent streams and valleys	Variable to low due to position in landscape	None	None	Low	None	Unknown	N/A
<b>Regional Unconformity</b>										
Tertiary (Pliocene)	Volcanic rocks (Tv)	Mostly lava flows of porphyritic andesite; black to dark gray; light-gray phenocrysts of plagioclase feldspar; individual flows may reach 30 m (100 ft) thick and can be traced for over a kilometer; about 145 m (475 ft) thick on Boulder Mountain and 107 m (350 ft) thick on Lake Mountain	Lava flows	High	None	Limited aerial extent	Plagioclase feldspar	None documented	N/A	
	Diorite porphyry intrusion (Tdp)	Intrusions of diorite porphyry; includes some monzonite porphyry on Mt. Pennell	Limited aerial extent	High	None	Limited aerial extent	Unknown	None documented	NA	
	Sedimentary and igneous rocks (Ts)	Sedimentary and igneous rocks irregularly intruded by igneous materials; many dikes and sills	Limited aerial extent	Insignificant	None	Limited aerial extent	None documented	None documented	N/A	
	Intrusive igneous rocks (Ti)	Intrusive dikes, sills, and a few plug-like dikes with intrusive breccias, remnants of a volcanic field; mostly dark gray, fine-grained porphyritic basalts with vesicles filled with calcite and analcite (a zeolite mineral); pyroxene most prominent phenocryst; volcanic field dated as 4.6 to 3.7 Ma	Dikes trend N 15° E, parallel to major joint trend	High	None	Limited aerial extent	Analcite (a zeolite mineral)	None documented	N/A	
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Tertiary (Paleocene-Eocene)	Flagstaff Limestone (Tf)	Limestone; light gray tuff, tuffaceous sandstone, to almost quartz sandstone, siltstone, claystone and conglomerate; tuff and tuffaceous beds are as abundant as limestone beds; limestone is yellowish-gray and grayish-orange and weathers to tints of cream pink; conglomerate is poorly sorted with well rounded pebbles and cobbles of white quartz, black chert, tan quartzite, and tan to gray silicified limestone; limestone beds are thin, 1.3 to 20 cm (0.5-8 in) thick; beds of tuff and tuffaceous sandstone range from 0.08 to 20 cm (0.03-8 in) thick; 150 m (500 ft); exposed NW of the park.	Not exposed in Capitol Reef	Variable – not exposed in Capitol Reef	Pebbles contain Paleozoic corals, bryozoans, crinoid stems, brachiopods; fresh-water ostracods ( <i>Metacypris</i> sp. & <i>Paracypris</i> sp.); algae ( <i>Chlorellopsis coloniata</i> ); gastropods	Not exposed in Capitol Reef; contains incompetent clay layers	None	Not exposed in Capitol Reef	N/A
	<b>Regional Unconformity</b>								
Cretaceous	Mesaverde Formation (Kmv)	Light brown, thick-bedded sandstone and thin interbedded dark gray shale; intertongues with Masuk mbr of the Mancos Shale; 90 to 120 m (300-400 ft) is exposed in extreme southeastern corner of Capitol Reef	Cliff former	High	None	Rockfall	None	None documented	N/A
	Masuk mbr of Mancos Shale (Kmm)	Yellowish-gray mudstone and minor bluish-gray to black mudstone with interbedded light gray sandstone; gradational contact with Emery mbr.; 200-230 m (650-750 ft) thick	Mudstones form slopes; sandstones form cliffs	Mudstones have low resistance; sandstones relatively high resistance	Gastropods, bivalves, turtles, crocodiles, ceratopsian dinosaurs	Minor rockfall hazard	None	None documented	Part of last North American interior seaway
	Emery mbr (Muley Canyon mbr) of Mancos Shale (Kme)	Light gray to yellow, medium-bedded sandstone containing interbedded carbonaceous shale and coal beds in the upper part; lower beds intertongue with the Blue Gate Shale mbr; about 90 to 120 m (300-400 ft) thick	Cliff former	Carbonaceous shales have low resistance; sandstone high	Unknown	Rockfall & cliff collapse – esp. if coal beds eroded	Minor coal	None documented	Part of last North American interior seaway
	Blue Gate Shale mbr of Mancos Shale (Kmb)	Laminated blue-gray and black bentonitic shale with a few interbedded light yellow sandstone and limestone lenses; thickness ranges from 365 m (1,200 ft) in the south to 455 m (1,500 ft) in the north	Weathers to gullied slopes similar to the slopes of the Tununk Shale	Low	Planktonic foraminifera ( <i>Clioscaphtes vermiformis</i> & <i>Clioscaphtes choteauensis</i> )	Bentonite in shales may be hazard to development	Bentonite	None documented	Part of last North American interior seaway
	Ferron Sandstone mbr of Mancos Shale (Kmf)	Fine-grained laminated brown sandstone and white cross-bedded sandstone containing interbedded carbonaceous shale and gray, impure coal in the upper part; intertongues with the Tununk Shale mbr; 60-120 m (205-385 ft) thick.	Cliff and ledge former	Relatively high	<i>Ophiomorpha</i> trace fossil; marine bivalve, <i>Inoceramus</i>	Rockfall & cliff collapse	Coal seams found north of Capitol Reef	None documented	Part of last North American interior seaway
	Tununk mbr of Mancos Shale (Kmt)	Bluish-gray and black bentonitic shale; interbedded mudstone, siltstone, and very fine-grained sandstone; locally fossiliferous; 165-220 m (540-720 ft) thick	Slope former	Low – erodes into gullied slopes	Marine invertebrate shell fragments	Clays may be a hazard to development	Bentonite	None documented	Part of last North American interior seaway
	Dakota Sandstone (Kd)	Yellowish-brown to gray quartz-rich sandstone and conglomerate with interbedded carbonaceous shale and thin coal beds; locally fossiliferous; deposited 92-96 Ma; 0 to 46 m (0-150 ft) thick	Weathers to small cliffs and hogbacks	Relatively high	Marine bivalves <i>Pycnodonte newberryi</i> & <i>Corbula</i> sp. in upper part; petrified wood in lower section	Minor rockfall	Coal	None documented	N/A
	<b>Regional Unconformity</b>								
	Cedar Mountain Formation (Kcm)	Variegated mudstone including some white, gray and brown sandstone and conglomerate (the Buckhorn Conglomerate mbr); deposited 97.5 to 113 Ma; 0 to 50 m (0-166 ft) thick in the north	Slope former; north of Capitol Reef, Buckhorn Conglomerate mbr forms a cliff at base of the formation.	Low except for Buckhorn Conglomerate mbr.	Freshwater mollusks & ostracods, fish scales, dinosaur bones, charophytes, pollen, and a <i>Tempskya</i> fern	Low	None	None documented	N/A

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Upper Jurassic	Brushy Basin mbr of Morrison Fm. (Jmb)	Variiegated, bentonitic mudstone including some white, gray and brown sandstone and conglomerate containing abundant red and green chert pebbles; gradational contact with Salt Wash member; thickness averages 60 m (200 ft) in the south and 60-100 m (200-350 ft) in the north	Slope former	Low; bentonite weathers to a "popcorn" surface	Contains many dinosaur quarries in UT & western CO	Swelling clays may be a hazard to development	Clays	None documented	World class dinosaur fossils	
	Salt Wash mbr of Morrison Fm. (Jms)	Thick-bedded light gray sandstone and chert-pebble conglomeratic sandstone interbedded with greenish to reddish mudstone; sandstones are fine- to medium-grained with moderate sorting; thickness varies from 30-60 m (100-200 ft) in the north to 150 m (500 ft) in the south	Discontinuous lenses of sandstone and conglomerate form ledges and small cliffs; shale forms slopes	Sandstone and conglomerate lenses more resistant than shales	Fragments of dinosaur bones and teeth	Minor occurrence of swelling clays	Uranium found in the Salt Wash in Utah and Western CO.	None documented	N/A	
	Tidwell mbr of Morrison Fm. (not mapped)	Red, green, or gray mudstone; difficult to recognize from the underlying Summerville Formation; maybe 15 to 30 m (50-100 ft) thick in Capitol Reef	Slope former	Low	Not differentiated in Capitol Reef	Not differentiated in Capitol Reef	None	None	N/A	
<b>Regional Unconformity</b>										
Middle Jurassic	Summerville Formation (San Rafael Gp) (Js)	Thin beds of reddish-brown siltstone and mudstone and fine-grained sandstone; map unit includes interbedded red and gray mudstone, pink and white gypsum, gray limestone, and gray sandstone in the Tidwell mbr of the Morrison Fm; mudstone and siltstone beds are 2.5 to 15 cm (1-6 in) thick, sandstone beds are 0.15 to 0.6 m (0.5 to 2 ft) thick; gypsum beds are 0.3 to 8.5 m (1-28 ft) thick; total about 15-75 m (50-250 ft) thick	Reddish slopes in Cathedral Valley; Exposed in steep slopes or cliffs on northeast side of Waterpocket Fold	Low	None documented in Capitol Reef	Contains some incompetent clay layers	Gypsum	None	N/A	
	<b>Regional Unconformity</b>									
	Curtis Fm (San Rafael Gp) (Jcu)	Thin- to thick-bedded white, fine-grained calcareous sandstone and siltstone and minor sandy limestone; sandstones contain glauconite; gradational with the Summerville Fm; discontinuous to the south and increases to about 55 m (175 ft) in the north;	Forms resistant caprock on some monoliths & cathedrals	Sandstone high; siltstone low	Unknown	Minor rockfall	Gypsum in other parts of Utah	None documented	N/A	
	<b>Regional Unconformity</b>									
	Entrada Sandstone (San Rafael Gp) (Je)	Thin- to thick-bedded reddish brown sandstone and siltstone (upper and lower part of formation); siltstone (middle part of formation); subangular to subrounded, fine-grained to very fine-grained quartz sandstone; calcareously cemented; Crossbedded units may reach 12 m (40 ft) thick; sandstone and siltstone in the north, siltstone in the south; ranges from 120 to 275 m (400-900 ft) thick	Cliff former in the north; slope former in the south	Erodes into knobby pinnacles (hoodoos), monoliths, and cathedrals	None documented	Rockfalls & cliff collapse	None documented	None documented	N/A	
	Carmel Fm (San Rafael Gp) (Jc)	Very fine-grained thin-bedded orange-red sandstone and siltstone; calcareous mudstone common in the lower half; pink gypsiferous siltstone & gray limestone beds in upper part; beds generally only a few inches thick but may reach 1.2 m (4 ft) thick; gypsum as veinlets and beds 0.3 to 0.6 m (1-2 ft) thick (beds 24 m, 80 ft, thick reported on black Ridge); gypsum is white, massive, finely crystalline or granular but may be greenish gray or green; banded appearance produced by alternation layers of whitish-gray limestone and gypsum with reddish-brown siltstone and sandstones; formation ranges from 60 m (200 ft) in the south to 305 m (1,000 ft) in the north	Reddish to red-brown flatirons (triangular-shaped spurs) form eastern rampart of Waterpocket Fold; ledge and slope former	Sandstone is resistant; siltstone and gypsum is not as resistant to erosion	None documented	Rockfalls	Gypsum	None documented	N/A	
Page Sandstone (not mapped)	Light reddish-brown, fine-grained large-scale cross-bedded sandstone; divided into Harris Wash, Judd Hollow, and Thousand Pocket members; red cliff above falls of Fremont River at mile marker 86.5 is Judd Hollow mbr; sandstone above cliff is Thousand Pockets mbr; ranges from 0 to 30 m (0-100 ft) thick in Capitol Reef	Red cliff above falls of Fremont River	High	None documented	Rockfalls	None	None documented	N/A		
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Lower Jurassic	Navajo Sandstone (Glen Canyon Group) (Jn)	White, yellow, and light reddish-brown, large-scale (60 ft) crossbedded fine-grained sandstone; well-rounded, frosted quartz sandstone; contact with Kayenta is gradational; thickness ranges from 240 m (800 ft) to 335 m (1,100 ft) along Waterpocket Fold	Forms massive white to reddish-brown cliffs, monoliths & domes (Capitol & Navajo)	High	None documented	Rockfalls & cliff collapse	None	None documented	Dunes possibly part of largest erg recorded on Earth
	Kayenta Fm. (Glen Canyon Group) (Jk)	Divided into three units based on weathering features; lower ledge and middle cliff units are very fine-grained sandstone; upper unit contains abundant siltstone; clay-pebble conglomerate and traces of interbedded mudstone and limestone throughout the formation; horizontal and small-scale lenticular and tabular cross-beds; cross-beds are small (few ft thick); gradational contact with Wingate; 107 m (350 ft) thick	Lower ledge forming unit; middle cliff forming unit; upper slope forming unit	Lower and middle units are more resistant than upper unit	Theropod dinosaur tracks	Rockfalls & cliff collapse in lower and middle units	None	None documented	N/A
	Wingate Sandstone (Glen Canyon Group) (Jw)	Reddish-brown, thin- to thick-bedded, fine-grained quartz sandstone; massive and crossbedded; well-rounded quartz grains; large-scale, low- to high-angle trough cross-sets; iron oxide cement produces reddish, salmon color; 107 m (350 ft) thick, thins slightly from east to west	Cliff former; caps the western escarpment of Waterpocket Fold; forms features like Castle & Fruita Cliffs	High except where undercut and then litters slopes of Owl Rock mbr of Chinle Fm	None documented	Rockfalls & cliff collapse	None	None documented	Dunes possibly part of largest erg recorded on Earth
<b>Regional Unconformity</b>									
Upper Triassic	Chinle Formation (TRc)	Owl Rock mbr: orange and purple mudstones, siltstones, and fine-grained sandstones with characteristic 0.3 to 3 m (1-10 ft) thick interbeds of mottled pink to green limestone; not bentonitic; micritic limestones have a knobby texture from coalescence of carbonate nodules; mudcracks filled with Wingate Sandstone; 46 to 61 m (150-200 ft) thick	Slopes below Wingate Sandstone cliffs	Low, but protected by cliffs	Large cylindrical burrows & ostracodes	Atypical of Chinle mudstones; not bentonitic	None	None documented	N/A
		Petrified Forest mbr: reddish-orange bentonitic siltstones and clayey quartz sandstone; lower 46 to 61 m (150-200 ft) forms slopes capped by a regionally persistent, crossbedded sandstone known as the "Capitol Reef bed" that forms a prominent cliff or ledge	Lower slopes capped by sandstone ledge or cliff of "Capitol Reef bed"	Low; bentonitic mudstones	Tetrapod remains, lungfish toothplates, coprolites, marine gastropods & mollusks, vertebrate fossils, petrified wood, crocodilian and amphibian teeth	Swelling clays may be a hazard to development	Green mica and feldspar in some beds	None documented	N/A
		Monitor Butte mbr: light purplish-gray, bentonitic claystones and clayey sandstones with interbeds and lenses of crossbedded sandstone and carbonate nodules; distinct color makes it readily traceable along the lower to middle slopes of the Waterpocket escarpment; most heterogeneous member of Chinle Fm	Slope former	Low; bentonitic mudstones	Lung fish burrows (5 in dia; 5 ft long); petrified plants	Swelling clays may be a hazard to development	Bentonite	None documented	N/A
		Shinarump mbr: yellowish-gray, fine- to coarse-grained, friable sandstone with lenses and interbeds of conglomerate and conglomeratic sandstone; pebbles comprised of quartz, quartzite, and chert; near west entrance, fills broad channels eroded into top of Moenkopi Fm; discontinuous, where absent, Monitor Butte rests on Moenkopi; up to 27 m (90 ft) thick	Prominent white cliff; forms caprock for Twin Rocks, Egyptian Temple, & Chimney Rock	More resistant than mudstones, but sandstones are friable	None documented	None documented	Not in Capitol Reef	None documented	N/A
<b>Regional Unconformity</b>									

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Lower Triassic	Moenkopi Formation (TRm)	Moody Canyon mbr: lower unit of horizontally laminated reddish-brown siltstones and upper unit of ripple laminated reddish-orange siltstones; lower unit is 61 to 91 m (200-300 ft) thick; upper unit is well exposed in lower part of the Egyptian Temple and at Chimney Rock and forms reddish-orange cliffs at base of Waterpocket escarpment	Lower unit forms slopes; Upper unit forms cliffs	Rippled siltstones are relatively resistant	None documented	None documented	None	None documented	N/A
		Torrey mbr: reddish-brown to chocolate colored siltstone and fine-grained sandstone with rare interbeds of mud-pebble conglomerate, sandy dolomite, dolomitic limestone, and claystone; sandstones have horizontal bedding & low angle cross-bedding; ripple marks & mudcracks in finer grained beds; halite crystal casts in upper part; about 76 to 98 m (250-320 ft) thick	Ledge former	Relatively resistant	Well known for large reptile and amphibian trackways	Minor rockfall	None documented	None documented	N/A
		Sinbad mbr: yellowish fossiliferous to muddy limestone and dolomite with subordinate amounts of siltstone and sandstone; oolitic layers (composed of tiny carbonate spheres) are characteristic of lower part; yellowish color and carbonate lithology distinguishes Sinbad from other Moenkopi members; carbonates are thin-bedded to laminated with some small-scale trough crossbedding; about 21 to 43 m (70-140 ft) thick	Ledge former	Relatively resistant	Inarticulate brachiopod, <i>Lingula</i> ; ammonite cephalopod, <i>Meekoceras</i>	Minor rockfall	None documented	None documented	N/A
		Black Dragon mbr: reddish conglomerate, siltstone, and sandstone; abundant angular chert in basal conglomerates from underlying Kaibab Ls.; interbeds of dolomite and limestone with sparse marine fossils in upper part; 15 to 34 m (50-110 ft) thick	Slope former	Less resistant than bordering formations	Sparse marine fossils in carbonates	None documented	None	None documented	N/A
<b>Regional Unconformity</b>									
Permian	Kaibab Limestone (PNK)	Light gray to white, cherty dolomite interbedded with thin calcareous sandstone and siltstone layers; limestone especially in lower half; exposed only in the deeply incised canyons along the western margin of Capitol Reef; middle and upper parts contain silcretes (siliceous paleosols) and calcretes (calcitic paleosols); channels reaching 30 m (100 ft) deep were scoured into the Kaibab when its surface was exposed during Middle Permian time; averages 61 m (200 ft) thick	Relatively inaccessible cliffs	Highly resistant	Brachiopods, <i>Neospirifer pseudocamer-atus</i> , <i>Dictyoclostus bassi</i> ; pelecypods, gastropods, crinoids, bryozoans	Rockfalls & cliff collapse	Asphalt blebs found in some vesicles; geodes with quartz and calcite crystals	None documented	Last shallow Paleozoic sea covering western North America
	Cutler Group (PNC)	White Rim Sandstone and Cedar Mesa Sandstone: light-yellow to gray, crossbedded quartz sandstones; well-rounded, moderately well-sorted with grains ranging in size from very fine- to medium grained; White Rim Sandstone cannot be distinguished from older Cedar Mesa Sandstone because the Organ Rock Shale that usually separates the two formations pinches out east of Capitol Reef; exposed only in the deeply incised canyons along the western margin of Capitol Reef; Cutler sandstones reach a thickness of 244 m (800 ft)	Relatively inaccessible cliffs	Highly resistant	Marine trace fossils, shark teeth	Rockfalls & cliff collapse	None	None documented	N/A