

Map Unit Properties Table

Age	Unit Name (Symbol)	Features and Description	Topographic Expression	Erosion Resistance	Suitability for Development	Hazards	Paleontological Resources	Cultural Resources	Mineral Occurrence	Habitat	Recreation	Geologic Significance	
QUATERNARY (latest Pleistocene — Holocene)	Younger Alluvium (Qa1)	Yellowish-gray to yellowish-orange; pebbly gravel & sand, minor thin sandy silt beds; North Platte River gravel includes granite, anorthosite, rhyolite, mafic igneous rocks, quartzite, gneiss, schist, sandstone, & chert eroded mostly from the Hartville uplift, Laramie Range, & Medicine Bow Mts in WY; includes locally derived clasts from Ogallala, Arikaree & White River Groups; includes channel, floodplain, terrace, & alluvial-fan deposits that fill valleys eroded into Tertiary bedrock; locally, deep, narrow anastomosing channels cut into the bedrock floor beneath North Platte River valley; locally has areas of colluvium, eolian sand (Qes), & bedrock too small to map separately; mostly 6–46 m (20–150 ft) thick.	Underlies the modern floodplain & low terraces generally less than 6 m (20 ft) above stream level in North & South Platte River valleys & along Pumpkin Creek, Lodgepole Creek, & other tributaries	Low (unconsolidated)	Floodplain along S bank of North Platte River; farmland outside of Monument	Flooding	None documented	Possible Native American & pioneer sites	Sand & gravel	Riparian; woody species of trees & exotic weeds along North Platte River	Can support low impact recreation (e.g., hiking, bird watching)	The composition of clasts in the tributaries reflects the formations exposed in the drainage basins.	
	Colluvium & Alluvium (Qca)	Moderate-brown to yellowish-gray; sand, silt, & minor gravel; grades laterally into younger deposits correlative with younger alluvium (Qa1) & into older deposits correlative with intermediate alluvium (Qa2). Thickness commonly 3–12 m (10–40 ft), locally up to 24 m (80 ft) thick.	Exposed mostly on alluvial fans sloping away from Scotts Bluff & Wildcat Ridge	Low (unconsolidated)	Contains roads & structures	Headward erosion of arroyos	None documented	Native American & pioneer sites	Possible sand & gravel	Mixed-grass prairie is the predominant vegetation type	Saddle Rock & other hiking trails	None	
TERTIARY (lower Miocene)	Arikaree Group (Ta)	Camp Clarke unit	Individual units in the Arikaree Group are not mapped separately because of their limited outcrop areas at the scale on the reference map. Yellowish gray to pale yellowish brown; sandy siltstone & silty sandstone, volcanoclastic layers; massive, resembles loess in the eastern 21 km (13 mi) of outcrop belt; contains potato-shaped calcareous concretions as much as 8 cm (3 in) in diameter; abundant calcrete layers (paleosols) with siliceous rhizoliths; coarser grained in the western half of outcrop belt; commonly 18–30 m (60–100 ft) thick; max 36 m (120 ft) thick. Two well-exposed subunits in lower part of the unit on Indian Creek about 14 km (9 mi) NNW of Bridgeport: 1) the informal Indian Creek beds of sandst, siltst, & clayst up to 34 m (110 ft) thick & 2) an unnamed unit composed of conglomerate, gravel, & sand up to 18 m (60 ft) thick with clasts as much as 0.6 m (2 ft) in diameter.	Exposed NE of the Monument.	Not exposed in Monument	Not exposed in Monument	Not exposed in Monument	Vertebrate fossils, locally abundant; siliceous rhizoliths	Not exposed in Monument	Not exposed in Monument	Not exposed in Monument	Not exposed in Monument	Paleosols & fossils may be used to analyze ecosystems
TERTIARY (upper Oligocene — lower Miocene)		Monroe Creek — Harrison Formations, undivided	Gray, brownish-gray, grayish-brown, & yellowish-gray; silty sand & silty, very fine-fine-grained sandstone; massive to poorly defined planar bedding; locally cross-bedded; contains conspicuous calcium carbonate-cemented concretions as much as tens of feet long called pipy concretions; locally derived conglomerate fills anastomosing channels eroded into older parts of Harrison & Monroe Creek strata; volcanic ash beds uncommon & are best exposed along south-flowing tributaries of North Platte River & on Wildcat Ridge; contact with underlying Gering Fm appears conformable but locally is erosional; commonly 24–36 m (80–120 ft) thick on N side of North Platte River valley & 60–90 m (200–300 ft) thick on Wildcat Ridge; up to 120 m (400 ft) thick.	Caprock at Scotts Bluff & Wildcat Ridge; massive & cross-bedded sandstone exposed in bluff	Caprock is more resistant than underlying sandstone, & siltstone	Summit parking lot at Scotts Bluff; radio towers on Wildcat Ridge	Potential rockfall & landslides	Extensive bioturbation (beetle? burrows), zones of siliceous rhizoliths	1933 survey marker on Scotts Bluff summit; other Native American & pioneer sites possible on summit	None documented	Ponderosa pine & juniper woodlands on bluff summits; non-native Eastern red cedar	Hiking (e.g., Saddle Rock Trail)	Primarily of eolian origin; basal ash bed at base of unit outside of the Monument (Olsen's 3rd ash) dated at 27.76 ±0.30 Ma (late Oligocene)

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TERTIARY (upper Oligocene)	Gering Formation	Gray, brownish gray, & brown; fine- to medium-grained sandstone, silty sandstone, & sandy siltstone; local conglomerate with pumice pebbles, marl, & volcanic ash beds; Two major subdivisions in outcrops along flanks of Wildcat Ridge: 1) <u>upper subdivision</u> , mostly fluvial origin, very thin to thin-bedded, horizontally stratified, fine-grained sandstone & sandy siltstone, locally includes some strata of eolian & shallow lacustrine (playa?) origin; contains as many as 5 superposed ash beds; typically 8–20 m (25–70 ft) thick; max thickness 27 m (90 ft), 2) <u>lower subdivision</u> fluvial sequence of horizontal, thin- to medium-bedded sandstone, locally cross-bedded & characterized by sand- to pebble-size pumice clasts, possibly from north-central CO; 18–24 m (60–80 ft) thick; max 35 m (115 ft) thick. Multiple fluvial cut-&-fill deposits along Lawrence Fork grade vertically into finer grained, massive, bedded strata of possible eolian origin; appear also to fill some paleo-gullies; 15–30 m (50–100 ft) thick; max about 40 m (130 ft) thick.	Exposed along Summit Trail. <u>Upper subdivision:</u> Best outcrops are at the Monument & immediately S of Chimney Rock <u>Lower subdivision:</u> Crops out E of the Monument (N of Broadwater); also recognized in drill holes in east-central Morrill County	Moderate to low	Low. Susceptible to mass wasting	Potential rockfall; landslides	<u>Upper subdivision:</u> fossil animal tracks; vertebrate fossils, possibly large ungulates (entelodonts?) <u>Lower subdivision:</u> Arikareean-age mammalian fossils common, especially in fluvial deposits	Unknown	<u>Upper subdivision:</u> calcite pseudomorphs after gypsum crystals are locally common	Sparse vegetation on steep bluff (thin soils, easily erodible strata)	Hiking (e.g., Saddle Rock Trail)	3 age dates from ash beds outside Monument: 28.28±0.15 Ma, 28.11±0.18 Ma, & 28.28±0.10 Ma (boundary of early to late Oligocene)
TERTIARY (lower Oligocene)	White River Group	Mostly eolian volcaniclastic sediments & some minor fluvial deposits; subdivided into 3 units (from youngest to oldest): a brown siltstone unit, the Whitney Member, & the Orella Member; units not mapped separately because of the scale of the reference map. <u>Brown siltstone unit:</u> Brown to yellowish-brown; sandy siltstone & silty, very fine grained sandstone; volcaniclastic (contains as much as 60% glass shards); local mudstone & fine- to coarse-grained sandstone; eolian part contains beds 0.6-1.5 m (2-5 ft) thick or is massive; fluvial channel-fill deposits are med to thin bedded 2.5 cm–0.6 m (1 in–2 ft thick) & cross-stratified; calcareous concretion zones common in massive sandy siltst; at least 2 ash beds in lower part; commonly 15–46 m (50–150 ft) thick; max thickness about 98 m (320 ft). <u>Whitney Mbr.:</u> Grayish-orange to yellowish-brown siltstone; composed of eolian volcaniclastic sediment; local mudstone & fine- to medium-grained fluvial sandstone; siltstone generally massive to very thick bedded 0.6–1.5 m (2–5 ft) thick. Siltstone cemented with authigenic clay & calcite; local lacustrine silt & diatomaceous silt; underlies brown siltstone unit & crops out in essentially the same areas; conformable on Orella Member; commonly 60–76 m (200–250 ft) thick; up to 90 m (300 ft). <u>Orella Mbr.:</u> Brown, greenish-gray to pink; mudstone & siltstone, volcaniclastics; local fine- to med-grained, fluvial, cross-bedded sandstone & thin-bedded mudstone; especially in upper half of the member; commonly 90–107 m (300–350 ft) thick; up to 120 m (400 ft) thick	Not exposed in the Monument. Exposed along Summit Trail & flanks of Wildcat Ridge Forms badlands topography in Monument	Not exposed in the Monument Moderate to low Low	Not exposed in the Monument Form relatively steep slopes above Qca Badlands topography; susceptible to erosion	None Potential rockfall; landslides Headward erosion of arroyos; illegal fossil collecting	Common invertebrate bioturbation features Fragments of oreodonts, turtles, & other mammals. Invertebrate fossils in lake sediments & paleosols; bioturbation common in volc ash beds Fossils of horses, oreodonts (<i>Merycoidodon</i>), prairie dogs, foxes, multiple tortoises (<i>Styemys</i>), mouse deer (<i>Leptomeryx</i>), beavers, cats, & fossil mammal burrows	Not exposed in the Monument Possible Native American & pioneer sites associated with Scott Spring Possible Native American & pioneer sites	Not exposed in the Monument None documented None documented	Not exposed in the Monument Sparse vegetation except near Scott Spring Badlands: Stark, barren landscape	Not exposed in the Monument Steep slopes; Saddle Rock Trail crosses Tbr on way to summit Hiking	Age dates from ash beds outside Monument: 30.05±0.19 Ma, 28.6±0.96 Ma (early Oligocene) Two regionally correlative ash beds in Monument. Upper ash age: 30.58±0.61 Ma Lower ash age: 31.85±0.02 Ma (early Oligocene) Fossils are type, or indicator, fossils; regionally correlative ash bed (M ash) in lower part

* Reference map of Swinehart and Diffendal (1997) did not use the member designations of the Gering proposed by Vondra and others (1969). Vondra and others (1969) included parts of what Swinehart and Diffendal (1997) mapped as Brule Formation (brown siltstone unit and Whitney Member) in their lowest unit, the Helvas Canyon Member and placed their Twin Sisters Pumice Conglomerate Bed at the base of their highest unit, the Mitchell Pass Member, but did not recognize the presence of sand-size pumice as much as 11 m (35 ft) below the base of the Twin Sisters Bed.