

Map Unit Properties Table

Age	Map Unit (Symbol)	Park Location (unit)	Description	Depositional Setting	Local and Global Significance	Suitability for Development and Recreation	Paleontological Resources	
Quaternary (Pleistocene and Holocene)	Engineering fill (Qef)	North and South units	Used in road construction	Roads, bridges, and built up areas (shown on topographic base map)	None	Fill should be anticipated in any area formerly disturbed by construction activities	None	
	Modern alluvium (Qal)	North and South units	Sand, silt, clay, & gravel, younger than 500 years old; includes alluvium under modern floodplain & lowest terrace surface; shallow aquifer 25–200 ft (7–61 m)	Modern stream channels, floodplain, and beneath low stream terraces	Part of Oahe Formation—sediments deposited during the Holocene Epoch in North Dakota	100- and 500- year floods, river erosion, channel migration	None	
	Older alluvium (Qoal)	North and South units	Sand, silt, clay, and gravel; distinguished from modern alluvium (Qal) by steep, typically vertical, erosion scarp; ≤20 ft (6 m) thick	Stream deposits beneath Holocene terraces	Part of Oahe Formation—sediments deposited during the Holocene Epoch in North Dakota	None	None	
	Alluvial fan deposits (Qf)	North and South units; in South Unit only, differentiated on map into modern and older units	Alluvial fan deposits (modern) (Qf1)	Highly variable sequence—ranging from coarse and poorly sorted sand and gravel to massive or laminated mud; typically consists of locally derived material, except for largest fans of largest tributaries	Present at the mouths of nearly every small valley but only the larger fans along the Little Missouri River and its major tributaries were mapped (Biek and Gonzalez, 2001)	Part of Oahe Formation—sediments deposited during the Holocene Epoch in North Dakota		Fossil bison
			Alluvial fan deposits (older) (Qf2)	Older fans—deeply incised and no longer receive sediment from their contributory streams				
	Mantled pediments (Qmp)	North and South units	Complex assemblage of active and incised alluvial deposits of sand, silt, and clay; mantle ≤3 ft (0.9 m) thick but may exceed 6 ft (1.8 m) in places	Erosional surfaces formed during arid and semiarid conditions; mantled with eolian and sheetwash deposits	Part of Coleharbor Group and Oahe Formation—sediments deposited during the Pleistocene and Holocene epochs in ND	None	None	
	Landslide deposits (Qls)	North and South units	Locally derived sediment; commonly rotational slumps; characterized by hummocky topography, numerous arcuate scarps, and chaotic bedding	Transported principally by gravity (e.g., slump, earth flow, rockfall, and creep) to hillsides and valley floors	None	Active or capable of renewed movement	None documented	
	Quaternary (Pleistocene)	Alluvium beneath Pleistocene terraces (Qt)	North and South Units; in South Unit differentiated into four map units by height above modern channel	Qt1—at 2,400 ft (732 m) above sea level, 160 ft (49 m) above modern drainage	Unconformity	Part of the Coleharbor Group—sediments deposited during the Pleistocene Epoch; sand and gravel (≤5 ft [1.5 m] thick)		24,000- year- old wood fragments; fossil bison
			Qt2—at 2,460 ft (750 m) above sea level, 220 ft (67 m) above modern drainage					
			Qt3—at 2,480 ft (756 m) above sea level, 240 ft (73 m) above modern drainage					
Qt4—at 2,500 ft (762 m) above sea level, 260–270 ft (79–82 m) above modern drainage								
Glacial erratics (Qg)		North Unit	Widely scattered granitic and carbonate boulders and cobbles; most are 1–2 ft (0.3–0.6 m) in diameter but some as large as 5 ft (1.5 m)	Deposited at maximum extent of glacial ice	Only evidence of glaciation in park; part of the Coleharbor Group—sediments deposited during the Pleistocene Epoch in North Dakota	None	None	
Upland gravel (QTa)	North and South units	Sand and gravel, underlain by loess; contains pebbles and cobbles of well- cemented, locally derived materials; ≤5 ft (1.5 m) thick	Stream deposits (terraces)	Uncertain correlation with other regional deposits, likely predates advance of ice into the area; Biek and Gonzalez (2001) simply mapped as indeterminate late Tertiary or Quaternary age	Petrified wood			
Tertiary (Paleocene)	Golden Valley Formation, Bear Den Member, Taylor bed silcrete lag (Tbsl)	North Unit, Achenbach Hills only	Silcrete (silica- cemented) blocks up to 10 ft (3 m) square and 2 ft (0.6 m) thick, most are about 1 ft (0.3 m) thick; lag deposit; forms a pavement	Swamp or marsh; a weathering horizon indicates hiatus in deposition	None	Trace fossils (i.e., roots and stems)		
		North and South units	Grayish brown siltstone, claystone, sandstone, and lignite; includes basal sandstone, 1 or 2 petrified wood horizons (depending on location), bentonite (“blue bed”) layer, and siltstone (lower and upper yellow beds); forms hoodoos	River, lake, and swamp environments; ash source from 250 mi (400 km) away; nearly complete section exposed in North Unit (760 ft [232 m]); lower 300 ft (91 m) exposed in South Unit	The most widespread unit in the park and the most widespread near- surface Tertiary formation in North Dakota; clinker (burnt lignite) important to development of badlands topography	Landslides, swelling soils, piping, and rill erosion	Petrified wood, fossil mollusks, concretions	
		South Unit	Bright yellowish brown siltstone, claystone, and sandstone; differentiated from Sentinel Butte Formation by (1) stratigraphic position with respect to the HT Butte lignite or clinker between the two units, and (2) color (brighter = Bullion Creek)	River, lake, and swamp environments	Fort Union Group represents clastic wedge of sediment eroded from Rocky Mountains during Laramide Orogeny	Coal fires and associated slumping in the HT Butte lignite	Petrified wood (uncommon)	