

Age	Stratigraphic Unit (map symbol)		Aquifer Unit	Rock Description
Quaternary	Artificial fill (af)		Unconsolidated sediment	Fill for dams and other projects.
	Alluvium (Qal)			Unconsolidated sand, silt, clay and gravel.
Permian (lower)	Pontotoc Group	Stratford Formation (Ps)	Upper confining unit ("post-Simpson" unit)	Shale and sandstone
Pennsylvanian (Upper)		Vanoss Formation		Shale facies (PNvs)
	Conglomerate facies (PNvc)			Limestone boulders, cobbles, and pebbles in a calcareous matrix.
Pennsylvanian (Middle)	Deese Group (PNd)			Sandstone, shale, limestone conglomerate, limestone.
	Atoka and Wapanucka Formations (PNaw)			Unfossiliferous sandstone and brown to gray shale.
Pennsylvanian (Lower)				
Mississippian (Upper)	Springer Formation (PNMs)			Black, fissile shale separated by thin beds of sandstone and limestone.
Mississippian (Middle)	Caney Shale (Mc)			Black, fissile shale with phosphatic concretions.
Mississippian (Lower)	Sycamore Limestone, Welden Limestone, Woodford Shale (MDsw)			Shale, cherty to silty limestone, black bituminous shale.
Devonian (Upper)				
Devonian (Lower)	Hunton Group (DSOh)	Upper part (Dhu)	Blue to white shale and argillaceous limestone.	
Silurian		Lower part (SOhl)	Fossiliferous to massive to argillaceous limestone.	
Ordovician (Upper)	Sylvan Shale and Viola Group (Osv)	Sylvan Shale (Os)	Soft, green to gray, fissile shale.	
		Viola Group (Ov)	Fossiliferous and cherty limestone.	
Ordovician (Middle)	Simpson Group	Bromide, Tulip Creek, McLish Formations (Obm)	Sandstone, shale, and limestone.	
		Oil Creek and Joins Formations (Ooj)	Basal conglomerate layer overlain by sandstone, limestone, and shale.	
Ordovician (Lower)	Arbuckle Group (upper part)	West Spring Creek and Kindblade Formations (Owk)	Mostly limestone that grades eastward into dolomite with sandstone and shale.	
		West Spring Creek Formation (Ow)	Limestone that grades eastward into dolomite with sandstone and shale.	

Figure 6. Schematic stratigraphic column for Chickasaw National Recreation Area. Age colors are standard colors approved by the US Geological Survey to indicate different time periods on geologic maps; they also correspond to the colors on the Map Unit Properties Table. Gray rows indicate units not mapped within the recreation area. Modified from Blome et al. (2013).



Table 2. Fossils documented in Chickasaw National Recreation Area.

Age	Rock Unit (map symbol)	Invertebrate Fossils
Upper Mississippian–Lower Pennsylvanian	Springer Formation (PNMs)	brachiopods, bryozoans, bivalves
Middle Pennsylvanian	Deese Group (PNd)	crinoids, endothyrids, brachiopods, mollusks
Lower Mississippian	Caney Shale (Mc)	Conodonts, pelecypods, gastropods, ostracodes, goniatites, cephalopods
Lower Devonian	Upper part Hunton Group (DSOh, Dhu)	Haragan Formation: brachiopods, trilobites, corals, gastropods, bivalves, sponges, anthozoans, straight cephalopods (<i>Rhinoceras</i> sp.), goniatites (ammonites), crinoids
Silurian		anthozoans, conodonts, crinoids, brachiopods, gastropods, crustaceans, foraminifers, ostracodes
Upper Ordovician	Lower part Hunton Group (SOHl)	anthozoans, conodonts, crinoids, brachiopods, gastropods, crustaceans, foraminifers, ostracodes
	Sylvan Shale (Os)	graptolites, chitinozoans
	Viola Group (Ov)	trilobites (<i>Crytolithus trilos</i> , <i>Isotelus</i>), graptolites
Middle Ordovician	Bromide Formation (Simpson Group) (Obm)	brachiopods, trilobites, bryozoans, graptolites, pelecypods, ostracodes, echinoderms

Fossil lists from Koch and Santucci (2003) and Blome et al. (2013). See updated information in Tweet et al. (2015).

to relatively cool marine water on continental shelves that were approximately 30 m (100 ft) deep (Shaw 1991). Mixing of two previously distinct genera in Oklahoma suggest that sea level rose, causing a marine transgression and the elimination of the biogeographic boundary separating the two genera. Reefs constructed from Ordovician bryozoans have been discovered just south of the recreation area and southeast of the city of Sulphur (Cuffey and Cuffey 1994).

Fossils from the Bromide Formation (**Obm**) have been well-studied. In addition to the discovery of bryozoan reefs, researchers have discovered new genera and species of ostracod; documented eight different species of the bivalve genus *Conocardium*; discovered a new genera of tubular bryozoan; and reported on many trilobite genera, including *Calliops*, *Dolichoharpesi*,

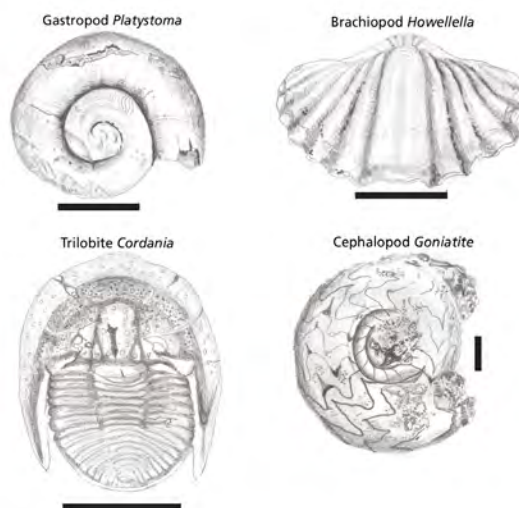


Figure 15. Common Paleozoic marine invertebrate fossils found in Oklahoma. The black bar is 1 cm (0.4 in) long. Sketches by Trista Thornberry-Ehrlich (Colorado State University) after specimens from the Sam Noble Museum (2015), available at: <http://commonfossilsofoklahoma.snomnh.ou.edu/> (accessed 24 April 2014).

Encrinuroides, *Homotelus*, *Lonchodomas*, and *Pandaspinapyga* (Sutherland and Amsden 1959; Levinson 1961; Esker 1964; Frederickson 1964; Branson 1966; Farmer 1975; Cuffey and Cuffey 1994).

Deep-marine fauna are found in the Upper Ordovician Sylvan Shale (**Os**) and Viola Group (**Ov**). Shale beds in both units contain graptolites, an extinct group of organisms that flourished in the Ordovician Period, and the Viola Group contains the deep-water trilobite *Crytolithus trilos* (Koch and Santucci 2003; Blome et al. 2013).

The upper part of the Hunton Group (**Dhu**) consists of two formations: (1) the Haragan Formation, which is very fossiliferous and crops out in the Goddard Youth Camp, and (2) the Bois d'Arc Formation, which is not exposed in Chickasaw National Recreation Area (Blome et al. 2013). The thin-bedded argillaceous limestone and mudstone of the Haragan Formation have produced numerous trilobites, brachiopods, corals, gastropods, and bivalves. A new trilobite species has been described from the Haragan Formation, and graptolites have been found at a site near Dougherty, Oklahoma (Koch and Santucci 2003). In addition to the invertebrate fossils listed in table 2, shark teeth and gastroliths (stomach stones) have also been recovered from Devonian strata.

