Map Unit Properties Table: Gila Cliff Dwellings National Monument (Ratté et al. 2014; scale 1:24,000)

Table includes only units mapped within Gila Cliff Dwellings National Monument. Refer to the Ancillary Map Information Document (gicl_geology.pdf, included with GIS data) for a listing of all map units in the GRI data set. Bold text refers to report sections.

Age	Map Unit (Symbol)	Geologic Description	Geologic Features and Processes	Geologic Issues	Geologic History
HOLOCENE	Alluvium (Qa)	Unconsolidated deposits of the floodplains of major streams. Maximum thickness several meters. No further description provided by Ratté et al. (2014); however, alluvium is generally unconsolidated sand and pebbles deposited within modern drainage systems.	None reported.	**Fluvial Features and Processes**—alluvium lines the Gila River and its tributaries. **Qa** indicates areas of potential flooding. **Post-Wildfire Sedimentation and Debris Flows**—stream valleys are likely locations for post-wildfire sedimentation and debris flows. **Climate Change**—flooding frequency and magnitude likely to change as climate changes.	**Valley Incision and Development of Cliff Dweller Canyon**—deposits mark modern stream channels and fluvial activity.
HOLOCENE? AND PLEISTOCENE	Alluvial terrace deposits (Qt) (Qt1, Qt2, and Qt3)	Alluvial deposits of undetermined thickness at several levels above the Gila River floodplain. No further description provided by Ratté et al. (2014); however, terrace gravels are generally larger clasts from previous floodplains. **Qt1**, **Qt2**, and **Qt3** refer to relative levels of floodplain deposits, with **Qt1** being the highest perched deposit and **Qt3** the lowest above the present floodplain. All three levels occur at the mouth of the Middle Fork Gila River. **Qt1**—highest perched terrace deposit (Holocene? and Pleistocene) **Qt2**—middle perched terrace deposit (Pleistocene) **Qt3**—lowest perched terrace deposit (Pleistocene)	**Terraces and Valley Incision**—terrace levels show where the Gila River paused in its downcutting and indicate that incision was not steady. **Paleontological Resources**—terrace gravels may contain Quaternary fossils. **Geological Features with Cultural Significance**—terraces provided adequate soil development, extent, and drainage for prehistoric farming in an area of mostly narrow, steep-sided canyons.	**Fluvial Features and Processes**—monument infrastructure and T J Site are on terraces. **Seismic Activity**—earthquakes have not been significant enough to cause offset in Quaternary deposits (e.g., terrace gravels). **Climate Change**—flooding frequency and magnitude likely to change as climate changes.	**Valley Incision and Development of Cliff Dweller Canyon**—intervals of accelerated valley deepening and widening appear to be associated with late Pliocene and Pleistocene glacial-pluvial ("wet") stages.
PLIOCENE? AND MIOCENE? (see note)	Gila Conglomerate (QTg)	Volcaniclastic fanglomerate and river gravels as much as 300 m (1,000 ft) thick in the deepest parts of the Gila Hot Springs graben. ***Note***: Depending on the study, the age of the Gila Conglomerate ranges from late Oligocene to middle Pleistocene. Ratté and Gaskill (1975) used Pliocene and Pleistocene, and possibly older. Ratté et al. (2014) used Pliocene? and Miocene?.	**Mogollon–Datil Volcanic Field**—Gila Conglomerate serves as upper boundary of the T4 volcanic unit. The contact between Bearwallow Mountain Andesite (**Tba**) and Gila Conglomerate is exposed in Gila Cliff Dwellings National Monument. **Gila Hot Springs Graben**—Gila Conglomerate is basin fill in graben. **Cave Features and Processes**—caves and other openings are characteristic features of Gila Conglomerate in the region. Seven caves in Cliff Dweller Canyon formed in Gila Conglomerate. **Paleontological Resources**—Gila Conglomerate has the potential to yield fossils. **Geological Features with Cultural Significance**—caves in Gila Conglomerate invited human use. Gila Conglomerate was used as building stone in cliff dwellings. Lithic resources occur in Gila Conglomerate, including small nodules of chert, agate, and chalcedony that fill fissures in the unit.	**Fluvial Features and Processes**—Gila Conglomerate is the reservoir/source of the spring and creek in Cliff Dweller Canyon. The high, sheltered location of the caves in the Gila Conglomerate protects the cliff dwellings from flooding. **Rockfall Hazards**—rockfall from cliff faces in Cliff Dweller Canyon is an ongoing management concern. **Spalling**—flakes, slabs, and blocks of rock break away from rock faces in caves, causing loss of pictographs and damage to structures. **Seismic Activity**—earthquakes of magnitude 5.5 or greater may cause rockfall from cliff faces of Gila Conglomerate. **Geothermal Development**—confines Bloodgood Canyon Tuff (**Tbt**) that serves as a geothermal reservoir.	**Basin and Range Faulting and Basin Filling**—concurrent with Basin and Range faulting. Streams transported sediments shed from surrounding volcanoes into the graben. **Valley Incision and Development of Cliff Dweller Canyon**—stream incised Gila Conglomerate. **Formation of Caves in Cliff Dweller Canyon**—stream action and groundwater sapping formed caves in Gila Conglomerate. This process continues to the present day.
MIOCENE AND OLIGOCENE	Andesitic to dacitic lava flows of the Middle Fork (Tmd)	Lava flows similar to the older Bearwallow Mountain Andesite (**Tba**) flows but distinguished from them by sparse but conspicuous, bright green pyroxene phenocrysts and quartz xenocrysts. These flows were tentatively but erroneously correlated with the Wall Lake flows of Elston (1968). Mixing of these flows with the underlying volcaniclastic sediments at the mouth of Adobe Canyon resulted in a peperite-like breccia. Thickness as much as about 100 ft (30 m) above the Middle Fork (Light Feather) hot spring, but pinches out toward the mouth of the Middle Fork.	**Mogollon–Datil Volcanic Field**—uppermost and youngest lava flows at Gila Cliff Dwellings National Monument. **Geological Features with Cultural Significance**—andesite is quite workable and well-suited for manufacturing cutting and piercing tools and provided raw material for artifacts found at the monument.	**Fluvial Features and Processes—**water in Cliff Dweller creek issues from the contact between the Gila Conglomerate and underlying volcanic rocks, which depending on local stratigraphy may be andesitic to dacitic latitic lava flows of the Middle Fork Gila River (**Tmd**).	**Volcanic Activity**—extruded after the formation of the Gila Cliff Dwellings and Bursum calderas.

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Age	Map Unit (Symbol)	Geologic Description	Geologic Features and Processes	Geologic Issues	Geologic History
OLIGOCENE	Volcaniclastic rocks of Adobe Canyon (Tav)	Orangey-brown, locally pumiceous sandstone. Along the Middle Fork Gila River. As much as 100 ft (30 m) thick.	**Mogollon–Datil Volcanic Field**—contains reworked pumice, which is essentially magma that has been frothed up by escaping gases and then cooled and solidified during eruption.	**Seismic Activity**—may represent past liquefaction (a geologic hazard where earthquake shaking causes water-saturated sediment to temporarily lose strength and act as a fluid).	**Basin and Range Faulting and Basin Filling**—may have developed at the time of the formation of the Gila Hot Springs graben.
	Bearwallow Mountain Andesite (Tba)	Andesitic to basaltic-andesite lava flows likely derived from shield volcanoes centered at Black Mountain to the north, and Brushy Mountain to the west of the Gila Hot Springs quadrangle. Commonly characterized by tiny reddish-brown, measles-like olivine phenocrysts that have been altered to iddingsite. Maximum thickness about 250 m (800 ft) as measured in the "Trailer Park" geothermal well in the Gila Hot Springs graben.	**Mogollon–Datil Volcanic Field**—related to the shield volcanoes that formed after ignimbrite formation and caldera collapse. The type locality is Bearwallow Mountain (volcano), which is 40 km (25 mi) northwest of Gila Cliff Dwellings National Monument. The contact between Bearwallow Mountain Andesite and Gila Conglomerate is exposed in the monument. **Geological Features with Cultural Significance**—andesite is quite workable and well-suited for manufacturing cutting and piercing tools and provided raw material for artifacts found at the monument.	**Fluvial Features and Processes**—water in Cliff Dweller creek issues from the contact between the Gila Conglomerate and underlying volcanic rocks, which depending on local stratigraphy may be Bearwallow Mountain Andesite (**Tba**). **Geothermal Development**—pervious zones in Bearwallow Mountain Andesite are geothermal reservoirs.	**Volcanic Activity**—extruded after the formation of the Gila Cliff Dwellings and Bursum calderas.
	Bloodgood Canyon Tuff (Tbt)	Light-gray rhyolite ignimbrite (ash-flow tuff) containing abundant phenocrysts of quartz and sanidine, minor biotite, and rare but conspicuous honey-yellow sphene in a eutaxitic, pumice-rich matrix. As much as 600 ft (180 m) thick in the "Trailer Park" geothermal well in the Gila Hot Springs graben.	**Mogollon–Datil Volcanic Field**—Bursum caldera was the source vent. Tuff fills the Gila Cliff Dwellings caldera and forms outflow sheet along Gila River canyon south and southeast of the caldera. **Geological Features with Cultural Significance**—rhyolite is quite workable and well-suited for manufacturing cutting and piercing tools and provided raw material for artifacts found at Gila Cliff Dwellings National Monument.	**Fluvial Features and Processes**—water in Cliff Dweller creek issues from the contact between the Gila Conglomerate and underlying volcanic rocks, which depending on local stratigraphy may be Bloodgood Canyon Tuff (**Tbt**). **Geothermal Development**—pervious zones in Bloodgood Canyon Tuff are geothermal reservoirs.	**Volcanic Activity**—erupted from Bursum caldera between 26.2 million and 25.3 million years ago.