

## Bedrock and Surficial Map Unit Properties Table: Aztec Ruins National Monument

Table shows units mapped by Brown and Stone (1979) on the eastern side of monument and Ward (1990) on the western side of monument. Colors in Map Unit column correspond to the bedrock and surficial map poster (in pocket). Bold text refers to sections in the GRI report.

Age	Map Unit (Symbol)	Geologic Description	Geologic Features and Processes	Geologic Resource Management Issues	Geologic History
QUATERNARY (Holocene)	Naha and Tsegi Alluviums, undifferentiated (Qnt) Ward (1990)	Well-stratified, yellowish gray and grayish brown silt and sand. Mapped where Naha and Tsegi Alluviums are indistinguishable, but probably consists of mostly Tsegi Alluvium. In places, <b>Qnt</b> buries outwash deposited by the Animas River.	<b>Alluvium—Qnt</b> is alluvium of Hack (1941) with the type area in Arizona. Correlation to New Mexico is uncertain. Mapped as a “finger” of Estes Arroyo in the monument.	<b>Abandoned Mineral Lands</b> —abandoned gas well occurs within the expanded boundaries of the monument. Associated map unit unknown.	<b>Glacial Record</b> —correlates to terrace <b>Qt7u</b> of Gillam (1998a), approximately 25,000–19,000 years old. <b>Ongoing Incision</b> —dissected by modern arroyos.
QUATERNARY (Holocene and Late Pleistocene)	Alluvium (Qal) Brown and Stone (1979)	Valley-fill deposits consisting of gravel, sand, silt, and clay in the modern floodplain, lowest outwash terraces, and overlying alluvial fans.	<b>Alluvium—Qal</b> covers most of the eastern half of the monument.	<b>Localized and Regional Subsidence</b> —small depressions have developed in the vicinity of East Ruin, which is situated on <b>Qal</b> of Brown and Stone (1979). <b>Piping</b> —minor geohazard at the monument. Soil pipes have developed in an eroding bank of the Fallon property along the Animas River. Could affect the stability of archeological sites via subsidence. Pipes may have cultural importance as the beginning of an excavated kiva. <b>Bank Erosion and Landscape Restoration</b> —the NPS goal is to restore natural function and appearance while protecting cultural resources along the banks of the Animas River. <b>Recreation and Land Use in the Animas River Corridor</b> —no park infrastructure was built on the floodplain, so flooding is not a significant issue. <b>Abandoned Mineral Lands</b> —abandoned gas well occurs within the expanded boundaries of the monument. Map unit unknown.	<b>Animas River on the Landscape—Qal</b> records aggradation by the Animas River or its tributaries. <b>Ongoing Incision—Qal</b> represents continuing deposition along rivers and streams.
QUATERNARY (Pleistocene)	Terrace and pediment deposits (Qtp) Brown and Stone (1979)	Veneers of gravel and sand along valley sides and on mesa tops, mainly in terraces and alluvial fans.	<b>Terraces—Qtp</b> is described as including both terrace and pediment alluvium. However pediments (gravel-covered erosional slopes) are absent or rare in the map area (Mary Gillam, independent consultant and researcher, written communication, 5 January 2016).	<b>Oil and Gas Development and Production</b> —well operations (e.g., Bobbie Herrera #1) account for localized and relatively minor impacts to natural resources, including denuded vegetation and eroded and compacted soil on terrace surfaces. <b>Abandoned Mineral Lands</b> —abandoned gas well occurs within the expanded boundaries of the monument. Associated map unit unknown. <b>Paleontological Resource Inventory, Monitoring, and Protection</b> —terraces contain reworked Paleozoic invertebrate fossils in limestone cobbles.	<b>Animas River on the Landscape</b> —formed as the Animas River was incising its channel and valley sides were retreating.
QUATERNARY (Pleistocene)	Terrace gravel, unit 5, lowest (Q5b) Ward (1990)	Terrace gravel consisting of glacial outwash and fan alluvium. Unit 5 has moderately developed soils that typically have stage II (Gile et al. 1966) carbonate. Lowest and youngest terrace that Ward did not include in other map units.	<b>Terraces—Q5b</b> consists mostly of glacial outwash from the Animas Glacier. Stepping up from the modern floodplain (represented by <b>Qal</b> ), terraces are past floodplains that mark former courses of the Animas River. Unit 5 includes subunits <b>Q5b</b> and <b>Q5a</b> , which represent the lowest and highest terraces of this group respectively.	<b>Abandoned Mineral Lands</b> —abandoned gas well occurs within the expanded boundaries of the monument. Associated map unit unknown. <b>Paleontological Resource Inventory, Monitoring, and Protection</b> —terraces contain reworked Paleozoic invertebrate fossils in limestone cobbles.	<b>Animas River on the Landscape—Q5b</b> documents river incision and represents a former Animas River floodplain. <b>Glacial Record</b> —equivalent to terrace <b>Qt6a</b> of Gillam (1998a), approximately 160,000–140,000 years old.

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Age	Map Unit (Symbol)	Geologic Description	Geologic Features and Processes	Geologic Resource Management Issues	Geologic History
QUATERNARY (Pleistocene)	Terrace gravel, unit 4, intermediate (Q4d) Ward (1990)	Terrace gravel consisting of glacial outwash and fan alluvium. Unit 4 has moderately developed soils that typically have stage III and locally stage IV (Gile et al. 1966) carbonate. Includes five subunits, from youngest to oldest Q4e, <b>Q4d</b> , Q4c, Q4b, and Q4a.	<b>Terraces—Q4d</b> consists of glacial outwash from the Animas Glacier. Stepping up from the modern floodplain, terraces are past floodplains that mark former courses of the Animas River. <b>Q4d</b> is an intermediate level terrace of Group 4, as mapped by Ward (1990). It is the highest and oldest in the monument.	<p><b>Oil and Gas Development and Production</b>—well operations (e.g., Bobbie Herrera #1) account for localized and relatively minor impacts to natural resources, including denuded vegetation and eroded and compacted soil on terrace surfaces.</p> <p><b>Adjacent Development</b>—potential impacts include loss of archeological resources, runoff-related erosion, and visual impairments.</p> <p><b>Abandoned Mineral Lands</b>—abandoned gas well occurs within the expanded boundaries of the monument. Associated map unit unknown.</p> <p><b>Paleontological Resource Inventory, Monitoring, and Protection</b>—terraces contain reworked Paleozoic invertebrate fossils in limestone cobbles.</p>	<p><b>Animas River on the Landscape</b>—incision of the Animas River valley began between about 18 million and 3 million years ago (Miocene and Pliocene epochs). <b>Q4d</b> documents river incision and represents a former Animas River floodplain.</p> <p><b>Glacial Record</b>—equivalent to terrace <b>Qt5a</b> of Gillam (1998a), approximately 340,000–250,000 years old.</p>
	Rocks or unconsolidated deposits from the Eocene through Pliocene epochs are not mapped within Aztec Ruins National Monument.				
PALEOGENE (Paleocene)	Nacimiento Formation (Tn) Brown and Stone (1979) Ward (1990)	Gray, green, and purple claystone, shale, and siltstone; gray and yellow, coarse conglomeratic cross-bedded and massive sandstone. Most areas that Ward mapped as <b>Tn</b> within the monument are covered by thin outwash alluvium and colluvium.	<p><b>Nacimiento Formation</b>—bedrock of the monument. Exposed in drainages on North Mesa.</p> <p><b>Building Stone and Lithic Resources</b>—ancestral Pueblos used <b>Tn</b> in construction. The distinctive “greenstone” bed was incorporated as a decorative band.</p>	<p><b>Oil and Gas Development and Production</b>—well operations (e.g., Bobbie Herrera #1, Fee 9Y, and Fee 4-A) account for localized and relatively minor impacts to natural resources, including denuded vegetation and eroded and compacted soil on terrace surfaces.</p> <p><b>Adjacent Development</b>—potential impacts include loss of archeological resources, runoff-related erosion, and visual impairments.</p> <p><b>Localized and Regional Subsidence</b>—small depressions have developed in the vicinity of East Ruin, which is situated on <b>Tn</b> of Ward (1990).</p> <p><b>Abandoned Mineral Lands</b>—abandoned gas well occurs within the expanded boundaries of the monument. Associated map unit unknown.</p> <p><b>Paleontological Resource Inventory, Monitoring, and Protection</b>—elsewhere, <b>Tn</b> yields vertebrate fossils important for interpreting the beginning of the “Age of Mammals.” Also yields plant fossils, including petrified wood, and invertebrate fossils.</p>	<p><b>Laramide Orogeny</b>—deposited during the mountain-building event that created the Rocky Mountains. <b>Tn</b> consists of sediments shed from uplifts into a subsiding basin.</p>