

Geologic Map of the San Pedro River, Babocomari River and Aravaipa Creek Corridors, Southeastern Arizona

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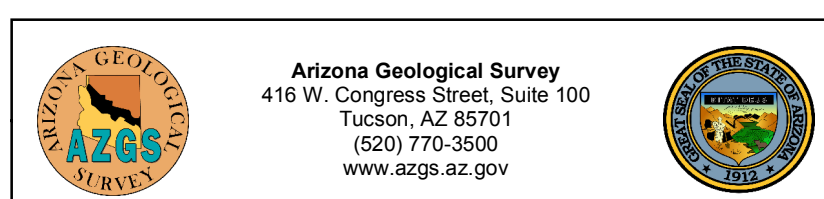
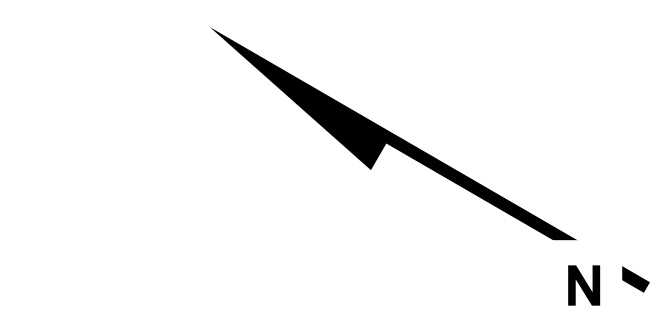
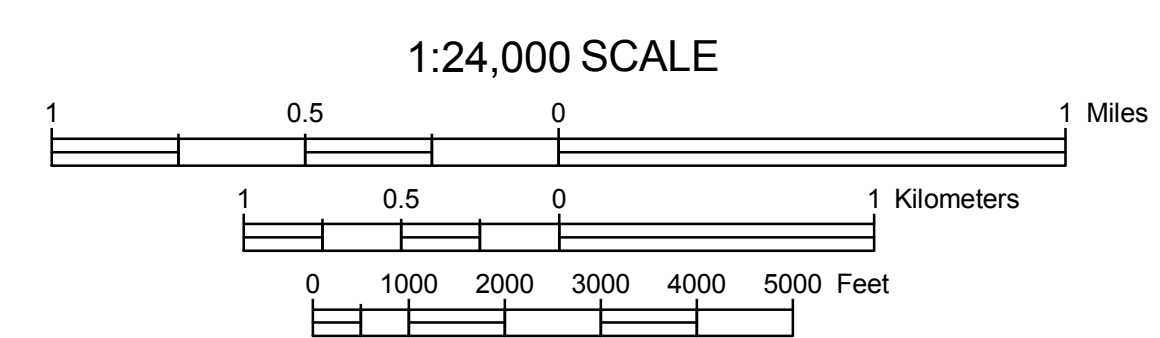
Digital Map DM-RM-1E, version 1.1

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Arizona Department of Water Resources

USGS 24k quadrangle series topographic base maps.
North American Datum of 1983. Projection and 1000-meter
grid ticks (blue): Universal Transverse Mercator, zone 12.

Bedrock and surficial geologic mapping for areas outside the lateral limits of Holocene river alluvium was compiled from the following sources:

- Cook, J.P. and Spencer, J.E., 2009. Geologic Map of the Redington 7 1/2 Quadrangle, Cochise, Graham, and Pima Counties, Arizona. Arizona Geological Survey Digital Geologic Map 60 (DGM-60) version 2.0. 1 sheet, layout scale 1:24,000, with text.
- Gootee, B.F., Spencer, J.E., Ferguson, C.A., Richard, S.M., Cook, J.P., and MacFarlane, B.J., 2009. Geologic map of the Clark Ranch 7 1/2 quadrangle and the western half of the Rhodes Peak 7 1/2 quadrangle, Pinal and Graham Counties, Arizona. Arizona Geological Survey Digital Geologic Map 58 (DGM-58), version 1.0, 1 sheet, layout scale 1:24,000, with text.
- Krieger, M.H., 1968. Geologic map of the Brandenburg Mountain quadrangle, Pinal County, Arizona. U.S. Geological Survey Geologic Quadrangle Map GQ-668, 3 p., 1 sheet, scale 1:24,000.
- Krieger, M.H., 1968. Geologic map of the Holy Joe Peak quadrangle, Pinal County, Arizona. U.S. Geological Survey Geologic Quadrangle Map GQ-669, 4 p., 1 sheet, scale 1:24,000.
- Pearthree, P.A., Cook, J.P., Skotnicki, S.J., and Spencer, J.E., 2009. Geologic map of the Peppersauce Wash 7 1/2 quadrangle and part of the Kieberg Canyon 7 1/2 quadrangle, Pinal and Pima Counties, Arizona. Arizona Geological Survey Digital Geologic Map 59 (DGM-59), version 1.0, 1 sheet, layout scale 1:24,000, with text.
- Simons, F.S., 1964. Geology of the Klondyke quadrangle, Graham and Pinal Counties, Arizona (Klondyke, Oak Grove Canyon, Coche Grande Mtn., and Booger Canyon 7 1/2 min). U.S. Geological Survey Professional Paper 461, 173 p.
- Spencer, J.E., Gootee, B.F., Richard, S.M., and Cook, J.P., 2009. Geologic map of the Mammoth 7 1/2 quadrangle, Pinal County, Arizona. Arizona Geological Survey Digital Geologic Map 67 (DGM-67), version 1.0, 1 sheet, layout scale 1:24,000, with text.



Map Unit Descriptions

Other units	Piedmont alluvium and surficial deposits	Bedrock	Tertiary basin fill alluvium
D Disturbed ground - heavily disturbed ground due to agriculture, extensive excavation, or construction of earth dams.	Qm Modern stream channel deposits - vertical channel deposits composed of very poorly sorted sand, pebbles, and cobbles with some boulders to moderately sorted sand and pebbles.	Tm Late Pliocene (?) Oquirrhine deposits, fluvial facies - sandstone and conglomerate, fluvial deposits.	Tm Late Miocene to Pliocene Oquirrhine deposits, alluvial fan facies - sandy to gravelly, moderately to strongly indurated alluvial fan deposits.
Qs Mine tailings - Tailings derived from processing ore from the San Manuel mine.	Ql Latest Holocene alluvium - unconsolidated, very poorly sorted silt to cobble low terrace and overflow channel deposits.	Tm Pliocene Oquirrhine deposits, sandy fan facies - sandy fan-like, low-lying, and delta front sandstone facies.	Tm Pliocene Oquirrhine deposits, playa lacustrine facies - fine-grained, laminated plays and lacustrine deposits.
Qp Paved areas - historically or actively paved fields, irrigated pastures, and other lightly disturbed ground.	Qaf Late Holocene alluvium, active fan deposits - active portions of young fan deposits exhibiting distributary drainage patterns.	Tm Pliocene Oquirrhine deposits, delta front subfacies - sandstone, locally pebbly, with multiple thin mudstone interbeds.	Tm Pliocene Oquirrhine deposits, low energy fluvial facies - alternating thin sands, consolidated levels of quartzite, silt, and very fine sand with sparse pebble gravels.
Qc Quaternary Holocene silt and colluvium - unconsolidated to weakly consolidated, very poorly sorted angular rock debris deposited at the base of bedrock slopes.	Qp Late Holocene alluvium - planar terrace deposits located along incised channels, broad low-lying distal fan deposits, truncating onto Holocene river alluvium, and infrequently active tributary drainage patterns.	Tm Pliocene Oquirrhine deposits, pediments mudstone facies - massive prograde mudstone deposited as broad-based fans of Pliocene time.	Tm Pliocene Oquirrhine deposits, pediments mudstone facies - massive prograde mudstone deposited as broad-based fans of Pliocene time.
Qr Active river channel deposits - unconsolidated, very poorly sorted sandy to cobble beds in active river channels.	Qp Clear Holocene alluvium - local, low-lying, undulating fan deposits exhibiting wind-eroded, shallow trapped drainage patterns.	Tm Gulture Volcanics - lateral equivalent of Cloudburst Formation.	Tm Pliocene Oquirrhine deposits, pediments mudstone facies - massive prograde mudstone deposited as broad-based fans of Pliocene time.
Qf Flood channel and low terrace deposits - unconsolidated sand, gravel and silt deposits on bars, low terraces and flood channels.	Qp Clear Holocene alluvium - local, low-lying, undulating fan deposits exhibiting wind-eroded, shallow trapped drainage patterns.	Tm Rhyolite intrusion and intrusive breccia - at the south edge of the map area, this unit consists of crystalline rhyolite and breccia overlain by tuffaceous sandstone and siltstone (Krieger, 1968).	Tm Pliocene Oquirrhine deposits, pediments mudstone facies - massive prograde mudstone deposited as broad-based fans of Pliocene time.
Qv Historical river terrace deposits - unconsolidated sand, gravel and silt deposits on low terraces that cap the abandoned early Holocene floodplain.	Qp Surface deposits, undivided - includes fine-grained colluvium and alluvium, silts, and some pediment and terrace gravels.	Tm Basaltic andesite (the Oquirrhine to lower Miocene) - Lava flows and andesite with 1-10% generally of iron sulfides and up to 10% of silty, friable andesite. Many country contacts abundant < 1 m plagioclase needles and equant magnetite.	Tm Pliocene Oquirrhine deposits, pediments mudstone facies - massive prograde mudstone deposited as broad-based fans of Pliocene time.
Qh Latest Holocene to historical river terrace deposits - all, clay, sand and minor gravel deposits underlying the early Holocene floodplain.	Qp Late Pliocene alluvial fan and terrace deposits - weakly consolidated sandy gravel deposits with strong soil development.	Tm Clastic sedimentary rocks - sandstone and siltstone with basal conglomerate, the lower Pliocene.	Tm Pliocene Oquirrhine deposits, pediments mudstone facies - massive prograde mudstone deposited as broad-based fans of Pliocene time.
Qe Late to early Holocene river terrace deposits - all, clay, sand and minor gravel terrace deposits slightly above the early Holocene floodplain.	Qp Middle to late Pliocene alluvial fan and terrace deposits - weakly consolidated sandy gravel deposits with strong soil development.	Tm Escabrosa Limestone - massive, cliff-forming, thick bedded, mostly coarsely grained limestone.	Tm Pliocene Oquirrhine deposits, pediments mudstone facies - massive prograde mudstone deposited as broad-based fans of Pliocene time.
Qd Middle to late Pliocene river terrace deposits - gravelly, sandy river terrace deposits up to 25 ft above the active river channel.	Qp Early to middle Pliocene alluvial fan and terrace deposits - high, moderately consolidated gravelly deposits with strong soil development.	Tm Martin Formation - slope-forming shale unit with interbedded limestone beds.	Tm Pliocene Oquirrhine deposits, pediments mudstone facies - massive prograde mudstone deposited as broad-based fans of Pliocene time.
Qc Middle to late Pliocene river terrace deposits - older, higher gravelly, sandy river terrace deposits.	Qp Early Pliocene alluvial fan and terrace deposits - coarse, moderately to well-consolidated gravelly deposits capping high rounded ridges.	Tm Arago Formation - thin to thick bedded, cross bedded, diatomitic sandstone with local oolites, siltstone, sandstone, and interbedded conglomerates. Dark chocolate brown calcareous sandstone is characteristic of this unit in unbedded deposits.	Tm Pliocene Oquirrhine deposits, pediments mudstone facies - massive prograde mudstone deposited as broad-based fans of Pliocene time.
Qb Early to middle Pliocene river terrace deposits - oldest, highest preserved gravelly, sandy river terrace deposits.	Qp Late Pliocene to early Pliocene fan gravel - coarse, moderately to well-consolidated gravelly deposits capping high rounded ridges.	Tm Bolea Quartzite - fine to locally medium-grained sandstone, plane bedded to blocky. Sandstone varies from chocolate brown to orange tan to white. Sandstone is coarse grained with locally mafic mineral inclusions, locally abundant, cylindrical trace fossils (burrows), < 1 cm diameter.	Tm Pliocene Oquirrhine deposits, pediments mudstone facies - massive prograde mudstone deposited as broad-based fans of Pliocene time.
	Qp Late Pliocene to early Pliocene fan gravel - coarse, moderately to well-consolidated gravelly deposits capping high rounded ridges.	Tm Diabase - Dark greenish gray to olive gray, medium grained diabase forming the peaks in all Pliocene rock units.	Tm Pliocene Oquirrhine deposits, pediments mudstone facies - massive prograde mudstone deposited as broad-based fans of Pliocene time.
	Qp Late Pliocene to early Pliocene fan gravel - coarse, moderately to well-consolidated gravelly deposits capping high rounded ridges.	Tm Tuff Quartzite - Thin bedded sandstone and granite to small pebbles conglomerate.	Tm Pliocene Oquirrhine deposits, pediments mudstone facies - massive prograde mudstone deposited as broad-based fans of Pliocene time.

Boundaries of Holocene River Alluvium

Thin, Solid Line	Clearly defined, accurately located contacts between Holocene river alluvium and bounding geologic units such as bedrock, Holocene, alluvial fan, and terrace deposits, and distinct edges of small, steep alluvial fans and talus slopes. Line location accurate to within 50 feet.
Thin, Dashed Line	Suite of geologic contacts between Holocene river alluvium and bounding geologic units. These boundaries are often associated with very low relief distal alluvial fan onsets onto Holocene river alluvium and are often located in historically plowed fields. Line location accurate to within 100 feet.
Thin, Dotted Line	Approximately located boundary between Holocene river alluvium and bounding geologic units. Dotted line boundaries are reserved for areas which are significantly disturbed by anthropogenic activity. Placement of dotted line boundaries is based on a combination of field verification and historical aerial photos and topographic data interpretation. Line location accurate to within 500 feet depending on level of disturbance (plowed vs. paved, original topography maintained/obliterated, etc.).
Waypoint Location	Showing station identification.
Other Geologic Lines	
Thin, Solid Line	Accurate contact
Thin, Dashed Line	Approximate contact
Thin, Dotted Line	Concealed contact
Hatched Line	Gravitational Contact
Solid, Bold Line	Accurate Fault
Dashed, Bold Line	Approximate Fault
Dotted, Bold Line	Concealed Fault