Geologic Map of Grand Canyon National Park

Arizona

National Park Service
U.S. Department of the Interior

Geologic Resources Inventory
Natural Resource Stewardship and Science

Park Boundary

Infrastructure

- Point of interest
- City
- Road

Faults

- Thrust fault, known or certain
- Reverse fault, known or certain, dotted where concealed
- Normal fault, known or certain, dashed where approximate, short-dashed where inferred, dotted where concealed
- High-angle fault, known or certain, dashed where approximate, dotted where concealed

Folds

- Dome
- Anticline, known or certain, dashed where approximate, dotted where concealed
- Syncline, known or certain, dotted where concealed
- Monocline, known or certain, dashed where approximate, dotted where concealed

Linear Dikes

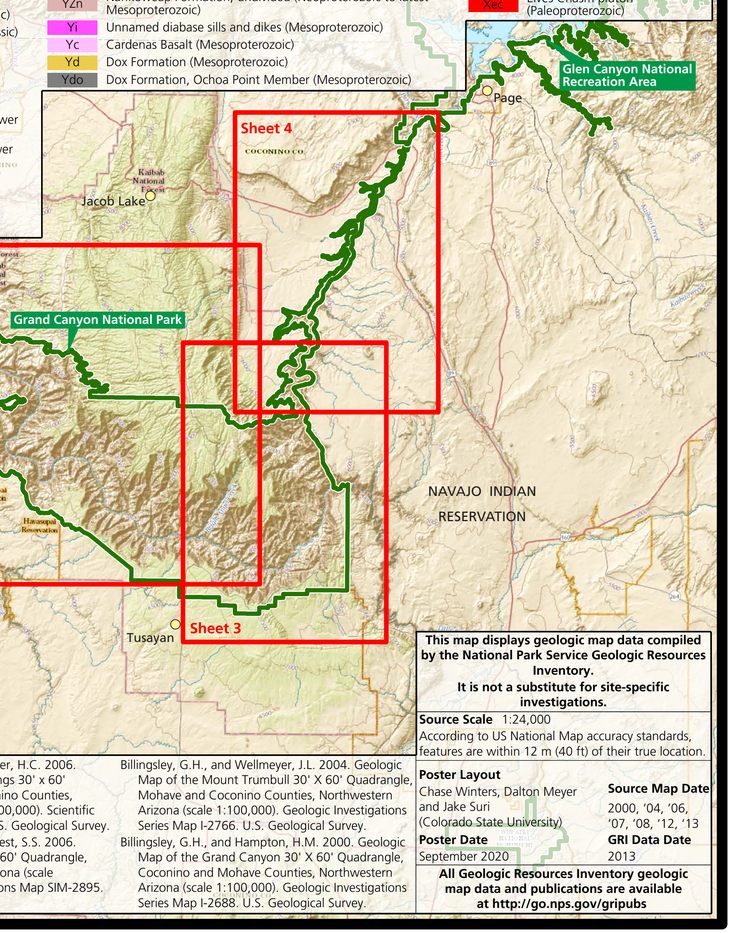
- Ydi - Diabase intrusive rocks (Proterozoic), known or certain

Volcanic Line Features

- Crater, known or certain
- Flow direction line, known or certain

Geologic Units

- Water
- Qaf — Artificial fill and quarries (Holocene)
- Qs — Stream-channel deposits (Holocene)
- Qf — Floodplain deposits (Holocene)
- Qd — Dune sand and sand sheet deposits, undivided (Holocene)
- Qes — Sand sheet deposits (Holocene)
- Qc — Colluvial deposits (Holocene)
- Qdl — Linear dune deposits (Holocene)
- Qdp — Parabolic dune deposits (Holocene)
- Qdb — Barchan dune deposits (Holocene)
- Qlsp — Little Spring Basalt, pyroclastic deposits (Holocene)
- Qlsb — Little Spring Basalt, basalt flows (Holocene)
- Qdm — Mixed dune deposits (Holocene)
- Qdlu — Linear dune and sand sheet deposits, undivided (Holocene)
- Qg1 — Young terrace-gravel deposits (Holocene and Pleistocene)
- Qtgr — Terrace gravel deposits (Holocene and Pleistocene)
- Qg2 — Intermediate terrace-gravel deposits (Holocene and Pleistocene)
- Qg3 — Old terrace-gravel deposits (Holocene and Pleistocene)
- Qa1 — Young alluvial fan deposits (Holocene and Pleistocene)
- Qa — Alluvial deposits (Holocene and Pleistocene)
- Qa2 — Intermediate alluvial fan deposits (Holocene and Pleistocene)
- Qr — Colorado River gravel and silt deposits (Holocene and Pleistocene)
- Qgy — Young alluvial terrace deposits (Holocene and Pleistocene)
- Qay — Young alluvial fan deposits (Holocene and Pleistocene)
- Qa3 — Old alluvial fan deposits (Holocene, Pleistocene and Pliocene(?))
- Qps — Ponded sediments (Holocene and Pleistocene(?))
- Qae — Mixed alluvium and eolian deposits (Holocene and Pleistocene(?))
- Qss — Sand sheet deposits (Holocene and Pleistocene(?))
- Qscf — Eolian and fluvial silt deposits (Holocene and Pleistocene(?))
- Qv — Valley-fill deposits (Holocene and Pleistocene)
- Qt — Travertine deposits (Holocene and Pleistocene)
- Qtr — Talus and rock-fall deposits (Holocene and Pleistocene)
- Ql — Landslide deposits (Holocene and Pleistocene)
- Qgo — Older alluvial terrace deposits (Holocene(?) and Pleistocene)
- Qsd — Silt dune deposits (Holocene and Pleistocene)
- Qdc — Eolian cinder dune deposits (Holocene and Pleistocene)
- Qsc — Eolian cinder sand sheet deposits (Holocene and Pleistocene)
- Qltb — Basalt of Larimore Tank, basalt flows (Pleistocene)
- Qlp — Little Tanks Basalt, pyroclastic deposits (Pleistocene)
- Qlb — Little Tanks Basalt, basalt flows (Pleistocene)
- Qhkp — Heaton Knolls Basalt, pyroclastic deposits (Pleistocene)
- Qhkb — Heaton Knolls Basalt, basalt flows (Pleistocene)
- Qgrp — Basalt of Graham Ranch, pyroclastic deposits (Pleistocene)
- Qgrb — Basalt of Graham Ranch (Pleistocene)
- Qmcb — Basalt flow of Merriam Crater (Pleistocene)
- Qyap — Pyroclastic deposits of S P Mountain (Pleistocene)
- Qyab — Basaltic andesite of S P Mountain (Pleistocene)
- Qyp — Pyroclastic deposits of five young cinder cones (Pleistocene)
- Qyb — Basalt flow of five young cinder cones (Pleistocene)
- Qtid — Tuckup Canyon Basalt, intrusive dikes (Pleistocene)
- Qtp — Tuckup Canyon Basalt, pyroclastic deposits (Pleistocene)
- Qtb — Tuckup Canyon Basalt, basalt flow (Pleistocene)
- Qhp — Basalt of Hancock Knolls, pyroclastic deposits (Pleistocene)
- Qhb — Basalt of Hancock Knolls, basalt flows (Pleistocene)
- Qspd — Sage Basalt, pyroclastic deposits (Pleistocene)
- Qsb — Sage Basalt, basalt flows (Pleistocene)
- Qidn — Basalt dikes and necks (Pleistocene)
- Qpyr — Pyroclastic deposits (Pleistocene)
- Qism — Intrusive dikes of Shadow Mountain (Pleistocene)
- Qsp — Pyroclastic deposits of Shadow Mountain (Pleistocene)
- Qsbf — Basalt flows of Shadow Mountain (Pleistocene)
- Qpyd — Pyroclastic deposits (Pleistocene)
- Qbf — Basalt flows (Pleistocene)
- Qbt — Basalt flow of Tappan Wash (Pleistocene)
- Qbfl — Fissure deposits of Lockett Tank (Pleistocene)
- Qbmp — Pyroclastic deposits (Pleistocene)
- Qbmb — Basalt flows (Pleistocene)
- Qsfp — Pumice of San Francisco Mountain (Pleistocene)
- Qmbi — Basalt dike (Pleistocene)
- Qmp — Pyroclastic deposits (Pleistocene)
- Qmb — Basalt flows (Pleistocene)
- Qmlp — Basalt flow of Lava Point (Pleistocene)
- Qslr — Rhyolite dome complex of Slate Mountain (Pleistocene)
- Qbcr — Basalt flows along the Colorado River (Pleistocene)
- Qi — Basalt of the Uinkaret Plateau, intrusive rocks, south of Mount Trumbull (Pleistocene)
- Qi1 — Basalt of the Uinkaret Plateau, intrusive rocks, north of Mount Trumbull (Pleistocene)
- Qp — Basalt of the Uinkaret Plateau, pyroclastic deposits, south of Mount Trumbull (Pleistocene)
- Qp1 — Basalt of the Uinkaret Plateau, pyroclastic deposits, north of Mount Trumbull (Pleistocene)
- Qb — Basalt of the Uinkaret Plateau, basalt flows, south of Mount Trumbull (Pleistocene)
- Qb1 — Basalt of the Uinkaret Plateau, basalt flows, north of Mount Trumbull (Pleistocene)
- Qkrp — Basalt of Kenworthy Ranch, pyroclastic deposits (Pleistocene)
- Qkrb — Basalt of Kenworthy Ranch, basalt flows (Pleistocene)
- Qmrp — Basalt of Marshall Ranch, pyroclastic deposits (Pleistocene)
- Qmrb — Basalt of Marshall Ranch, basalt flows (Pleistocene)
- Qp6375 — Basalt of hill 6375, pyroclastic deposits (Pleistocene)
- Qb6375 — Basalt of hill 6375, basalt flows (Pleistocene)
- Qp6646 — Basalt of hill 6646, pyroclastic deposits (Pleistocene)
- Qb6646 — Basalt of hill 6646, basalt flows (Pleistocene)
- Qp6457 — Basalt of hill 6457, pyroclastic deposits (Pleistocene)
- Qb6457 — Basalt of hill 6457, basalt flows (Pleistocene)
- Qpvp — Basalt of Potato Valley, pyroclastic deposits (Pleistocene)
- Qpvb — Basalt of Potato Valley, basalt flows (Pleistocene)
- Qp6588 — Basalt of hill 6588, pyroclastic deposits (Pleistocene)
- Qb6588 — Basalt of hill 6588, basalt flows (Pleistocene)
- Qcbi — Basalt of Craigs Knoll and Berry Knoll, intrusive dikes or necks (Pleistocene)
- Qcbp — Basalt of Craigs Knoll and Berry Knoll, pyroclastic deposits (Pleistocene)
- Qcbb — Basalt of Craigs Knoll and Berry Knoll, basalt flows (Pleistocene)
- Qg4 — Older terrace-gravel deposits (Pleistocene)
- QTwb — Basalt flows of Woodhouse Mesa (Pleistocene or Pliocene)
- QTi — Hells Hole dikes (Pleistocene or Pliocene(?))
- QTd — Old dune deposits, undivided (Pleistocene and Pliocene(?))
- QTdl — Old linear dune deposits (Pleistocene and Pliocene(?))
- QTdp — Old parabolic dune deposits (Pleistocene and Pliocene(?))
- QTes — Old eolian sand sheet and dune deposits (Pleistocene and Pliocene(?))
- QTg — Terrace-gravel deposits (Pleistocene and Pliocene(?))
- QTae — Old mixed alluvium and eolian deposits (Pleistocene and Pliocene(?))
- QTa4 — Older alluvial fan deposits (Pleistocene and Pliocene)
- QTgd — Old gravel deposits (Pleistocene, Pliocene, and middle Miocene)
- QTg4 — Older terrace-gravel deposits (Pleistocene and Pliocene(?))
- QTg5 — Youngest old terrace-gravel deposits (Pleistocene, Pliocene and Miocene)
- Qg5-18 — Oldest terrace-gravel deposits, undivided (Pleistocene and Pliocene(?))
- QTg6 — Intermediate old terrace-gravel deposits (Pleistocene and Pliocene(?))
- QTg7 — Oldest old terrace-gravel deposits (Pleistocene and Pliocene(?))
- QTvsl — Volcanic rocks of the San Francisco Volcanic Field, intrusive dike or plug (Pleistocene or Pliocene)
- QTpsf — Volcanic rocks of the San Francisco Volcanic Field, pyroclastic deposits (Pleistocene or Pliocene)
- QTbsf — Volcanic rocks of the San Francisco Volcanic Field, basalt flows (Pleistocene or Pliocene)
- QTai — Volcanic rocks of the San Francisco Volcanic Field, basalt and andesite dikes and necks (Pleistocene or Pliocene)
- QTap — Volcanic rocks of the San Francisco Volcanic Field, basalt and andesite pyroclastic deposits (Pleistocene or Pliocene)
- QTab — Volcanic rocks of the San Francisco Volcanic Field, basalt and andesite flows (Pleistocene or Pliocene)
- Thma — Andesite flows of Howard Mesa (Pliocene)
- Tbi — Dike in ampitheater (Pliocene)
- Tp — Pyroclastic deposits (Pliocene)
- Tb — Basalt flows (Pliocene)
- Tei — Basalt north of Mount Emma, intrusive rocks (Pliocene)
- Tep — Basalt north of Mount Emma, pyroclastic deposits (Pliocene)
- Teb — Basalt north of Mount Emma, basalt flows (Pliocene)
- Tmlb — Basalt of Mount Logan, basalt flows (Pliocene)
- Tbid — Basalt of Bundyville, intrusive dikes (Pliocene)
- Tbb — Basalt of Bundyville, basalt flows (Pliocene)
- Tmi — Basalt of Mount Trumbull, intrusive rocks (Pliocene)
- Tmb — Basalt of Mount Trumbull, basalt flows (Pliocene)
- Tgw — Basalt of the Grand Wash Trough, dikes and necks (Pliocene)
- Tbgw — Basalt of the Grand Wash Trough, basalt flows (Pliocene)
- Tgs — Gravel and sedimentary deposits (Pliocene to lower Paleocene(?))
- Tyi — Volcanic rocks of the San Francisco Volcanic Field, young intrusive rocks (Pliocene)
- Typ — Volcanic rocks of the San Francisco Volcanic Field, young pyroclastic deposits (Pliocene)
- Tyb — Volcanic rocks of the San Francisco Volcanic Field, young basalt flows (Pliocene)
- Twi — Whitmore Dike Swarm, intrusive dikes (Pliocene)
- Twb — Whitmore Dike Swarm, basalt flow (Pliocene)
- Tpki — Basalt of Poverty Knoll, intrusive dike (Pliocene)
- Tpkb — Basalt of Poverty Knoll, basalt flow (Pliocene)
- Tpi — Poverty Mountain Basalt, intrusive neck (Pliocene)
- Tpp — Poverty Mountain Basalt, pyroclastic deposits (Pliocene)
- Tpb — Poverty Mountain Basalt, basalt flows (Pliocene)
- Tgi — Grassy Mountain Basalt, intrusive dikes (Pliocene)
- Tgp — Grassy Mountain Basalt, basalt flows (Pliocene)
- Tgb — Grassy Mountain Basalt, pyroclastic deposits (Pliocene)
- Tay — Alluvium and calcrete soil deposits (Pliocene and Miocene)
- Tao — Alluvial deposits (Pliocene and Miocene)
- Tgr — Rocks of the Grand Wash Trough, red siltstone, sandstone, and conglomerate facies (Pliocene and Miocene)
- Tbpb — Black Point Basalt flows (Pliocene)
- Tscd — Old stream-channel deposits (Pliocene and Miocene)
- Tocb — Basalt flow of Cedar Ranch Mesa (Miocene)
- Tsi — Shiwits Basalt, intrusive rocks (Miocene)
- Tsp — Basalt of the Shiwits Plateau, pyroclastic deposits (Miocene)
- Tsb — Shiwits Basalt, basalt flows (Miocene)
- T227i-277 — Mile intrusive (Miocene)
- Tbmi — Blue Mountain Basalt, dikes and necks (Miocene)
- Tbmb — Blue Mountain Basalt, basalt flows (Miocene)
- Tp6i — Dikes of Parashant Canyon and Hundred and Ninetysix Mile Creek (Miocene)
- T2i — Dikes of Colorado River Mile 202 (Miocene)
- Tsgi — Snap Point Basalt and Garrett Dikes, intrusive dikes (Miocene)
- Tsgb — Snap Point Basalt and Garrett Dikes, basalt flows (Miocene)
- Tgc — Rocks of the Grand Wash Trough, paleozoic-clast conglomerate (Miocene)
- Tgl — Rocks of the Grand Wash Trough, limestone and siltstone facies (Miocene)
- Tgg — Rocks of the Grand Wash Trough, gypsum and gypsiferous siltstone facies (Miocene)
- Tgx — Proterozoic-clast conglomerate facies (Miocene)
- Trb — Volcanic rocks of the San Francisco Volcanic Field, basalt flow of Red Butte (Miocene)
- Tri — Volcanic rocks of the Mount Floyd Volcanic Field, rhyolite, rhyodacite, and obsidian dikes, necks, and vent areas (upper Miocene)
- Tr — Volcanic rocks of the Mount Floyd Volcanic Field, rhyolite, rhyodacite, and obsidian flows (upper Miocene)
- Tiba — Volcanic rocks of the Mount Floyd Volcanic Field, basalt and andesite dikes, plugs, and necks (upper Miocene)
- Tc — Volcanic rocks of the Hualapai Plateau, pyroclastic deposits (Miocene)
- Tv — Volcanic rocks of the Hualapai Plateau, andesite flows and basalt flows, undivided (Miocene)
- Tba — Volcanic rocks of the Mount Floyd Volcanic Field, basalt and andesite flows (upper Miocene)
- Tbfn — Volcanic rocks of the Hualapai Plateau, basalt flow of Nelson (middle to lower Miocene)
- Ti — Volcanic rocks of the Hualapai Plateau, intrusive dikes (Miocene)
- Ths — Horse Spring Formation, Rainbow Gardens Member (Miocene and Oligocene)
- TKs1 — Old gravel and sedimentary deposits (lower Miocene, Oligocene, Eocene, Paleocene, and Upper Cretaceous)
- Ts — Sedimentary rocks (lower Eocene and upper Paleocene)
- TKs2 — Oldest gravel and sedimentary deposits (Paleocene(?) and Upper Cretaceous)
- Kp — Quartz monzonite pluton (Upper Cretaceous)
- Km — Mancos Shale (Upper Cretaceous)
- Kd — Dakota Sandstone (Upper Cretaceous)
- Jms — Morrison Formation, Salt Wash Member (Upper Jurassic)
- Jr — Romana Sandstone (Middle Jurassic)
- Je — Entrada Sandstone (Middle Jurassic)
- Jc — Carmel Formation, undivided (Middle Jurassic)
- Jcu — Carmel Formation, Paria River Member and Winsor Member undivided (Middle Jurassic)
- Jcj — Carmel Formation, Judd Hollow Tongue and Page Sandstone Tongues, undivided (Middle Jurassic)
- Jp — Page Sandstone (Middle Jurassic)
- Jn — Navajo Sandstone (Lower Jurassic)
- Jkn — Kayenta Formation and Navajo Sandstone transition zone (Lower Jurassic)
- Jk — Kayenta Formation, undivided (Lower Jurassic)
- Jks — Kayenta Formation, Springdale Sandstone Member (Lower Jurassic)
- Jm — Moenave Formation and Wingate Sandstone, undivided (Lower Jurassic and Upper Triassic(?))
- Jmw — Moenave Formation, Whitmore Point Member (Lower Jurassic)
- Jmd — Moenave Formation, Dinosaur Canyon Member (Lower Jurassic)
- TRc — Chinle Formation, undivided (Upper Triassic)
- TRco — Chinle Formation, Owl Rock Member (Upper Triassic)
- TRcp — Chinle Formation, Petrified Forest Member (Upper Triassic)
- TRcs — Chinle Formation, Shinarump Member (Upper Triassic)
- TRm — Moenkopi Formation, undivided (Upper(?), Middle(?) and Lower Triassic)
- TRmu — Moenkopi Formation, upper red member (Middle(?) and Lower Triassic)
- TRms — Moenkopi Formation, Shnabkaib Member (Lower Triassic)
- TRmw — Moenkopi Formation, Wupatki Member (Lower Triassic)
- TRmlm — Moenkopi Formation, lower red member, Virgin Limestone Member, and middle red member, undivided (Lower Triassic)
- TRmm — Moenkopi Formation, middle red member (Lower Triassic)
- TRmv — Moenkopi Formation, Virgin Limestone Member (Lower Triassic)
- TRml — Moenkopi Formation, lower red member (Lower Triassic)
- TRmt — Moenkopi Formation, Timpoweap Member (Lower Triassic)
- Pk — Kaibab Formation, undivided (Lower Permian)
- Pkh — Kaibab Formation, Harrisburg Member (Lower Permian)
- Pkf — Kaibab Formation, Fossil Mountain Member (Lower Permian)
- Pt — Toroweap Formation, undivided (Lower Permian)
- Ptw — Toroweap Formation, Woods Ranch Member (Lower Permian)
- Ptb — Toroweap Formation, Brady Canyon and Seligman Members, undivided (Lower Permian)
- Pts — Toroweap Formation, Seligman Member (Lower Permian)
- Pc — Coconino Sandstone (Lower Permian)
- Ph — Hermit Formation (Lower Permian)
- Pe — Esplanade Sandstone (Lower Permian)
- Pep — Esplanade Sandstone and Pakoon Limestone, undivided (Lower Permian)
- PNMs — Wescogame Formation, Manakacha Formation, and Watahomigi Formation, undivided (Pennsylvanian and Upper Mississippian)
- Ms — Surprise Canyon Formation (Upper Mississippian)
- Mr — Redwall Limestone, undivided (Mississippian)
- Dtb — Temple Butte Formation (Upper and Middle Devonian)
- Cm — Muav Limestone (Middle Cambrian)
- Cba — Bright Angel Shale (Middle Cambrian)
- Ct — Tapeats Sandstone (Middle and Lower(?) Cambrian)
- Zs — Sixtymile Formation, undivided (Neoproterozoic)
- Zkw — Kwagunt Formation, Walcott Member (Neoproterozoic)
- Zka — Kwagunt Formation, Awatubi Member (Neoproterozoic)
- Zkcb — Kwagunt Formation, Carbon Butte Member (Neoproterozoic)
- Zgd — Galeros Formation, Duppa Member (Neoproterozoic)
- Zgcc — Galeros Formation, Carbon Canyon Member (Neoproterozoic)
- Zgj — Galeros Formation, Jupiter Member (Neoproterozoic)
- Zgt — Galeros Formation, Tanner Member (Neoproterozoic)
- YZn — Nankoweap Formation, undivided (Neoproterozoic to latest Mesoproterozoic)
- Yi — Unnamed diabase sills and dikes (Mesoproterozoic)
- Yc — Cardenas Basalt (Mesoproterozoic)
- Yd — Dox Formation (Mesoproterozoic)
- Ydo — Dox Formation, Ochoa Point Member (Mesoproterozoic)
- Ydc — Dox Formation, Comanche Point Member (Mesoproterozoic)
- Yds — Dox Formation, Solomon Temple Member (Mesoproterozoic)
- Yde — Dox Formation, Escalante Creek Member (Mesoproterozoic)
- Ys — Shinumo Sandstone, undivided (Mesoproterozoic)
- Yh — Hakatai Shale, undivided (Mesoproterozoic)
- Yb — Bass Formation (Mesoproterozoic)
- Ydi — Diabase intrusive rocks (Proterozoic)
- Yg — Young granite and pegmatite (Proterozoic)
- Xg — Granite (Paleoproterozoic)
- Xgr — Granite, granitic pegmatite and aplite (Proterozoic)
- Xgd — Granodiorite-gabbro-diorite and granodiorite complexes (Proterozoic)
- Xum — Ultramafic rocks (Paleoproterozoic)
- Xdg — Diorite, gabbro, and anorthosite (Proterozoic)
- Xs — Schist (Proterozoic)
- Xv — Vishnu Schist (Proterozoic)
- Xr — Rama Schist and Gneiss (Paleoproterozoic)
- Xbr — Brahma Schist (Paleoproterozoic)
- Xm — Mafic metavolcanic rocks (Proterozoic)
- Xo — Orthoamphibole schist (Proterozoic)
- Xc — Carbonate and chert (Proterozoic)
- Xu — Crystalline rocks, undivided (Proterozoic)
- Xec — Elves Chasm pluton (Paleoproterozoic)



This map displays geologic map data compiled by the National Park Service Geologic Resources Inventory.
It is not a substitute for site-specific investigations.

Source Scale 1:24,000
According to US National Map accuracy standards, features are within 12 m (40 ft) of their true location.

Poster Layout
Chase Winters, Dalton Meyer and Jake Suri (Colorado State University)

Source Map Date
2000, '04, '06, '07, '08, '12, '13

Poster Date
September 2020

GRI Data Date
2013

All Geologic Resources Inventory geologic map data and publications are available at http://go.nps.gov/gripubs

Source Map

Billingsley, G.H., and Priest, S.S. 2013. Geologic Map of the Glen Canyon Dam 30' x 60' Quadrangle, Coconino County, Arizona (scale 1:000,000). Scientific Investigations Map SIM-3268. U.S. Geological Survey.

Billingsley, G.H., Stoffer, P.W., and Priest, S.S. 2012. Geologic Map of the Tuba City 30' x 60' Quadrangle, Coconino County, Arizona (scale 1:50,000). Scientific Investigations Map SIM-3227. U.S. Geological Survey.

Billingsley, G.H., Priest, S.S., and Felger, T.J. 2008. Geologic Map of the Fredonia 30' x 60' Quadrangle, Mohave and Coconino Counties, Northern Arizona (scale 1:00,000). Scientific Investigations Map SIM-3035. U.S. Geological Survey.

Billingsley, G.H., Priest, S.S., and Felger, T.J. 2007. Geologic Map of the Cameron 30' x 60' Quadrangle, Coconino County, Northern Arizona (scale 1:100,000). Scientific Investigations Map SIM-2977. U.S. Geological Survey.

Billingsley, G.H., Block, D.L., and Dyer, H.C. 2006. Geologic Map of the Peach Springs 30' x 60' Quadrangle, Mohave and Coconino Counties, Northwestern Arizona (scale 1:100,000). Scientific Investigations Map SIM-2900 U.S. Geological Survey.

Billingsley, G.H., Felger, T.J., and Priest, S.S. 2006. Geologic Map of the Valle 30' x 60' Quadrangle, Coconino County, Northern Arizona (scale 1:100,000). Scientific Investigations Map SIM-2895. U.S. Geological Survey.

Billingsley, G.H., and Wellmeyer, J.L. 2004. Geologic Map of the Mount Trumbull 30' X 60' Quadrangle, Mohave and Coconino Counties, Northwestern Arizona (scale 1:100,000). Geologic Investigations Series Map I-2766. U.S. Geological Survey.

Billingsley, G.H., and Hampton, H.M. 2000. Geologic Map of the Grand Canyon 30' X 60' Quadrangle, Coconino and Mohave Counties, Northwestern Arizona (scale 1:100,000). Geologic Investigations Series Map I-2688. U.S. Geological Survey.