

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science Directorate
Geologic Resources Division



City of Rocks National Reserve

GRI Ancillary Map Information Document

Produced to accompany the Geologic Resources Inventory (GRI) Digital Geologic Data for City of Rocks National Reserve

ciro_geology.pdf

Version: 9/7/2021

Geologic Resources Inventory Map Document for City of Rocks National Reserve

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Geologic Resources Inventory Map Document



City of Rocks National Reserve, Idaho

Document to Accompany Digital Geologic-GIS Data

[ciro_geology.pdf](#)

Version: 9/7/2021

This document has been developed to accompany the digital geologic-GIS data developed by the Geologic Resources Inventory (GRI) program for City of Rocks National Reserve, Idaho (CIRO).

Attempts have been made to reproduce all aspects of the original source products, including the geologic units and their descriptions, geologic cross sections, the geologic report, references and all other pertinent images and information contained in the original publication.

This document contains the following information:

- 1) **About the NPS Geologic Resources Inventory Program** – A brief summary of the Geologic Resources Inventory (GRI) Program and its products. Included are web links to the GRI GIS data model, and to the GRI products page where digital geologic-GIS datasets, scoping reports and geology reports are available for download. In addition, web links to the NPS Data Store and GRI program home page, as well as contact information for the GRI coordinator, are also present.
- 2) **GRI Digital Map and Source Citation** – A listing of the GRI digital geologic-GIS map produced for this project along with the source used in their completion. In addition, a brief explanation of how the source map was used is provided.
- 3) **Map Unit List** – A listing of all geologic map units present on the map for this project, generally listed from youngest to oldest.
- 4) **Map Unit Descriptions** – Descriptions for all geologic map units.
- 5) **Geologic Cross Sections** – Geologic cross section graphics with source geologic cross section abbreviations.
- 6) **Ancillary Source Map Information** – Additional source map information presented by the source map. For the source map this includes a correlation of map units, map legend, location map, and references.
- 7) **GRI Digital Data Credits** – GRI digital geologic-GIS data and ancillary map information document production credits.

For information about using GRI digital geologic-GIS data contact:

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About the NPS Geologic Resources Inventory Program

Background

The Geologic Resources Inventory (GRI) provides geologic map data and pertinent geologic information to support resource management and science-informed decision making in more than 270 natural resource parks throughout the National Park System. Geologic resources for management consideration include both the processes that act upon the Earth and the features formed as a result of these processes. Geologic processes include: erosion and sedimentation; seismic, volcanic, and geothermal activity; glaciation, rockfalls, landslides, and shoreline change. Geologic features include mountains, canyons, natural arches and bridges, minerals, rocks, fossils, cave and karst systems, beaches, dunes, glaciers, volcanoes, and faults.

The GRI is one of 12 inventories funded by the National Park Service (NPS) Inventory and Monitoring Program. The Geologic Resources Division of the NPS Natural Resource Stewardship and Science Directorate administers the GRI. The NPS Geologic Resources Division partners with the Colorado State University Department of Geosciences to produce GRI products. Many additional partners participate in the GRI process by contributing source maps or reviewing products.

The GRI team undertakes three tasks for each park in the Inventory and Monitoring program: (1) conduct a scoping meeting and provide a summary document, (2) provide digital geologic map data in a geographic information system (GIS) format, and (3) provide a GRI report. These products are designed and written for nongeoscientists.

Products

Scoping Meetings: These park-specific meetings bring together local geologic experts and park staff to inventory and review available geologic data and discuss geologic resource management issues. A summary document is prepared for each meeting that identifies a plan to provide digital map data for the park.

Digital Geologic Maps: Digital geologic maps reproduce all aspects of traditional paper maps, including notes, legend, and cross sections. Bedrock, surficial, and special purpose maps such as coastal or geologic hazard maps may be used by the GRI to create digital Geographic Information Systems (GIS) data and meet park needs. These digital GIS data allow geologic information to be easily viewed and analyzed in conjunction with a wide range of other resource management information data.

For detailed information regarding GIS parameters such as data attribute field definitions, attribute field codes, value definitions, and rules that govern relationships found in the data, refer to the NPS Geology-GIS Data Model document available at: <https://www.nps.gov/articles/gri-geodatabase-model.htm>

Geologic Reports: GRI reports synthesize discussions from the original scoping meeting, follow up conference call(s), and subsequent research. Chapters of each report discuss the geologic setting of the park, distinctive geologic features and processes within the park, highlight geologic issues facing resource managers, and describe the geologic history leading to the present-day landscape. Each report also includes a poster illustrating these GRI digital geologic-GIS data.

For a complete listing of GRI products visit the GRI publications webpage: <https://go.nps.gov/gripubs>. GRI digital geologic-GIS data is also available online at the NPS Data Store: <https://irma.nps.gov/DataStore/Search/Quick>. To find GRI data for a specific park or parks select the appropriate park(s), enter "GRI" as a Search Text term, and then select the Search button.

For more information about the Geologic Resources Inventory Program visit the GRI webpage: <https://>

www.nps.gov/subjects/geology/gri.htm. At the bottom of that webpage is a “Contact Us” link if you need additional information. You may also directly contact the program coordinator:

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The Geologic Resources Inventory (GRI) program is funded by the National Park Service (NPS) Inventory and Monitoring (I&M) Division. Learn more about I&M and the 12 baseline inventories at the I&M webpage: <https://www.nps.gov/im/inventories.htm>.

GRI Digital Map and Source Map Citation

The GRI digital geologic-GIS map for City of Rocks National Reserve, Idaho (CIRO):

Digital Geologic-GIS Map of City of Rocks National Reserve and Vicinity, Idaho (*GRI MapCode CIRO*)

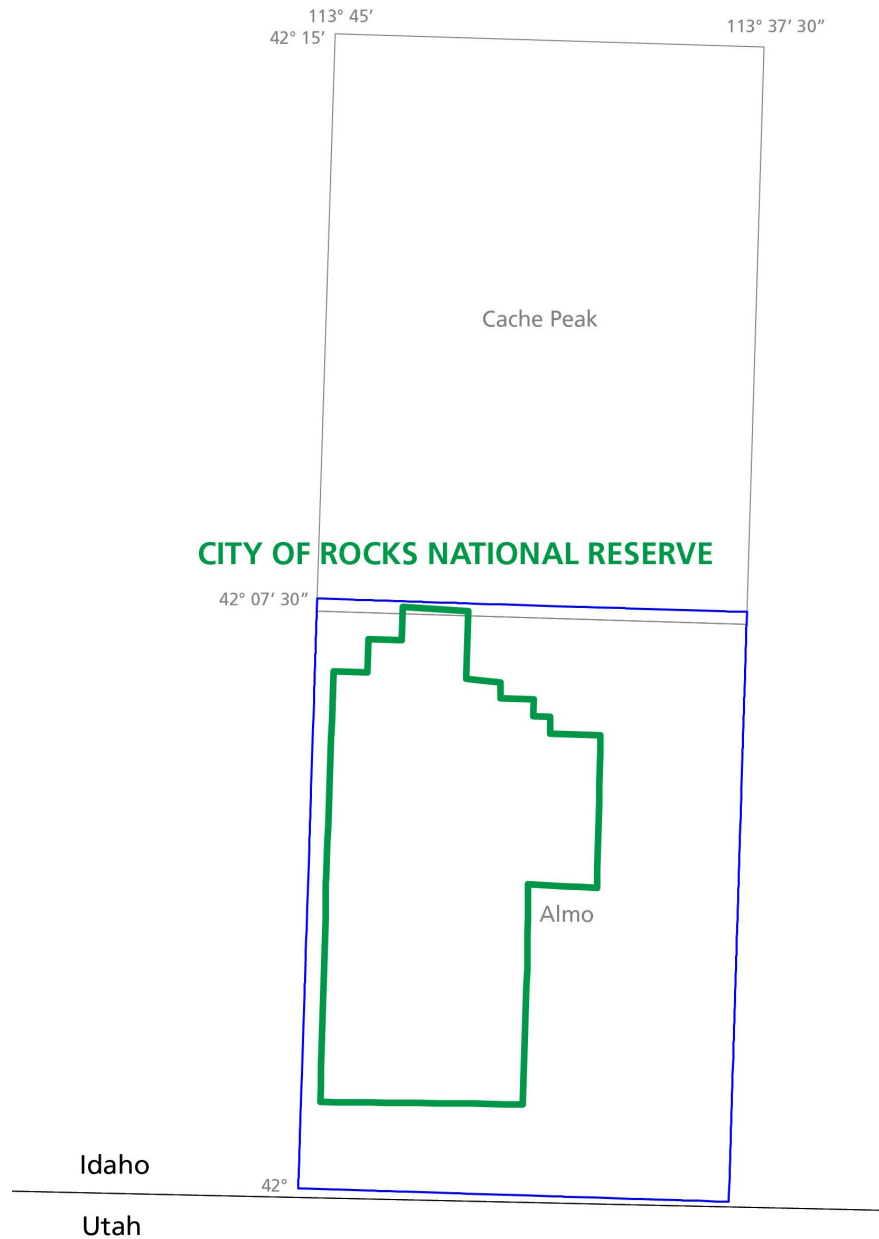
The map was produced from the following source map (listed below). The full extent of the source map was used, and all geologic features within this extent were captured.

Miller, D.M., et. Al., 2008, Preliminary Geologic Map and Digital Database of the Almo Quadrangle and City of Rocks National Reserve, Cassia County, Idaho: U.S. Geological Survey, Open-File Report 2008-1103, scale 1:24,000 ([Almo Quadrangle and City of Rocks National Reserve](#)). (*GRI Source Map ID 4154*).

Additional information pertaining to each source map is also presented in the GRI Source Map Information (CIROMAP) table included with the GRI digital geologic-GIS data.

Index Map

The following index map displays the extents of the GRI digital geologic-GIS map produced for City of Rocks National Reserve (CIRO) shown in blue. The boundary for City of Rocks National Reserve (as of September 2021) is outlined in green. Also shown are the 7.5' quadrangle extents for the Cache Peak and Almo quadrangles in gray as well as the state line between Idaho and Utah.



Index map by Kajsa Holland-Goon and James Winter (Colorado State University).

Map Unit List

The geologic units present in the digital geologic-GIS data produced for City of Rocks National Reserve, Idaho (CIRO) are listed below. Units are listed with their assigned unit symbol and unit name (e.g., Qal - Alluvium). Units are listed from youngest to oldest. No description for water is provided. Information about each geologic unit is also presented in the GRI Geologic Unit Information (CIROUNIT) table included with the GRI geologic-GIS data. Some source unit symbols, names and/or ages may have been changed in this document and in the GRI digital geologic-GIS data. This was done if a unit was considered to be the same unit as one or more units on other source maps used for this project, and these unit symbols, names and/or ages differed. In this case a single unit symbol and name, and the unit's now recognized age, was adopted. Unit symbols, names and/or ages in a unit descriptions, or on a correlation of map units or other source map figure were not edited. If a unit symbol, name or age was changed by the GRI the unit's source map symbol, name and/or age appears with the unit's source map description.

Cenozoic Era

Quaternary Period

[Qal](#) - Alluvium

[Qya](#) - Younger alluvial fan deposits

[Qya/Qia](#) - Holocene age alluvial fan deposits over Pleistocene age alluvial fan deposits

[Qyf](#) - Younger fluvial deposits

[Qvp](#) - Veneer on pediment

[Qls](#) - Landslide deposits

[Qc](#) - Colluvium

[Qt](#) - Talus

[Qia](#) - Intermediate alluvial fan deposits

[Qia/Qoa](#) - Alluvial fan deposits deposited onto Pleistocene age older alluvial fan deposits

Quaternary and Tertiary? Periods

[Qia/QTa](#) - Alluvial fan deposits deposited onto Pleistocene and Pliocene? age alluvium and landslide deposits

Quaternary Period

[Qif](#) - Intermediate fluvial deposits

[Qoa](#) - Older alluvial fan deposits

[Qof](#) - Older fluvial deposits

Quaternary and Tertiary? Periods

[QTa](#) - Alluvium and landslide deposits

[QTf](#) - Fluvial deposits

Tertiary Period

[Tr](#) - Rhyolite

[Ts](#) - Sedimentary deposits

[Tg](#) - Granite

Paleozoic Era

Ordovician Period

[Op](#) - Metamorphosed Pogonip Group

Neoproterozoic Era

[Zmp](#) - Schist of Mahogany Peaks

[Zcb](#) - Quartzite of Clarks Basin

[Zss](#) - Schist of Stevens Spring

[Zy](#) - Quartzite of Yost
[Zun](#) - Schist of the Upper Narrows
[Ze](#) - Elba Quartzite of Armstrong (1968)

Archean Eon

[Wga](#) - Amphibolite of the Green Creek Complex of Armstrong and Hills (1967)
[Wgg](#) - Granite and granite gneiss of the Green Creek Complex of Armstrong and Hills (1967)
[Wgs](#) - Schist of the Green Creek Complex of Armstrong and Hills (1967)

Map Unit Descriptions

Descriptions of all geologic map units, generally listed from youngest to oldest, are presented below. All unit descriptions from: [Almo Quadrangle and City of Rocks National Reserve](#).

Qal - Alluvium (Holocene)

Dark brown, organic-rich, sand and mud deposited in active washes and on adjacent flood plains; subordinate gravel in places. Typically supports dense vegetation. Unit typically 2 to 3 m thick.

Qya - Younger alluvial fan deposits (Holocene)

Dark brown, organic-rich, gravel, sand, and silt forming alluvial fans. Most alluvial fans issue from steep hills and pass from steep upper parts to low-gradient lower parts. In lower, eastern parts of Circle Creek and Twin Sisters basins, fan deposits consist of muddy sand, organic rich in places. Locally contains the Mazama ash (~6,700 years old) in these locations. As mapped, unit incorporates some colluvium and debris flows in upper, steep parts of fans and locally incorporates alluvium in lower reaches. Fan deposits may have thick A horizon due to loess influx in Holocene. Unit typically 1 to 4 m thick.

Qya/Qia - Holocene age alluvial fan deposits over Pleistocene age alluvial fan deposits (Holocene/Pleistocene)

Qya/Qia - Younger alluvial fan deposits (Holocene) overlies Intermediate alluvial fan deposits (Pleistocene) A thin sheet, less than 2 meter thick, layer of younger alluvial fan deposits ([Qya](#)) overlies Intermediate alluvial fan deposits ([Qia](#)).

Qyf - Younger fluvial deposits (Holocene)

Sand, mud and gravel associated with the perennial Raft River system. Active river floored largely by gravel. Deposits largely sand and fine gravel, but with mud beds and drapes. Deposits lie unconformably on glacial-derived gray muds of unit [Qif](#). Floodplain terraces have an organic horizon and weak calcic horizon. In tributary channels, charcoal in fluvial sediments of the river plain is dated at about $8,265 \pm 35$ radiocarbon years before present (9,410 to 9,120 calibrated years; Table 1).

Qvp - Veneer on pediment (Holocene and Pleistocene)

Sediment forming thin veneer on pediment cut into granite. Sediment consists of colluvium, alluvium, and alluvial fan deposits of variable age. As mapped, includes small patches of pediment (bedrock exposure). Grades in many cases to alluvial deposits of intermediate age ([unit Qia](#)). Deposits generally less than 1 m thick; in all cases less than 3 m thick.

Qls - Landslide deposits (Holocene and Pleistocene)

Dark-colored, bouldery, disaggregated deposits showing slump-block morphology. Springs and dense vegetation typically occur on and near landslide deposits. Most common on steep slopes at base of outcrops of Elba Quartzite. In a few places, forms stepped slopes of regularly repeated slumps. Mostly unforested. Deposits less than 10 m thick.

Qc - Colluvium (Holocene and Pleistocene)

Light to dark brown, loose, unsorted rubble of rock and soil, generally on steep slopes. Deposits move mainly by gravity (slumping, tumbling, and creep) and less as transport by water (sheetwash). Includes blocky material on and near Graham Peak that has moved by frost action. Less than 5 m thick.

Qt - Talus (Holocene and Pleistocene)

White, blocky boulder deposits on very steep slopes. Angular and generally lacks matrix of fine-grained materials. Forms mostly in areas of rockfall and colluvium derived from Elba Quartzite; locally at base of prominent spires of granite such as Twin Sisters. Accumulates mainly by rockfall and downslope creep. Mostly unforested and less than 5 m thick.

Qia - Intermediate alluvial fan deposits (Pleistocene)

Medium- to dark-brown, gravelly sand and sandy loam deposited mainly as alluvial fans, but including colluvium in steeper upland areas and small deposits of alluvium in low-gradient areas. Cobbles and boulders prevalent on steep slopes, less on flatter areas; large clasts composed of quartzite. Sand and loam composed of decomposed granite and quartz in most places. In places, includes overlying loess of varying thickness, typically 20 to 50 cm. Deposits display broad alluvial fan morphology with flat crests, but are incised by active streams associated with Holocene deposits. Distinguished from younger and older deposits by landform and presence of one or two well-developed soils, including argillic and calcic horizons; soils in places separated by loess. Stage II calcic soil of Machette (1985) common; stage IV soil also present. Thickness of unit less than 5 m in upland areas and greater than 10 m near Almo and Big Cove.

Qia/Qoa - Alluvial fan deposits deposited onto Pleistocene age older alluvial fan deposits (Pleistocene/Pleistocene)

Qia/Qoa - Intermediate alluvial fan deposits (Pleistocene) overlies older alluvial fan deposits (Pleistocene) A thin sheet, less than 2 meter thick, layer of intermediate alluvial fan deposits ([Qia](#)) overlies older alluvial fan deposits ([Qoa](#)).

Qia/QTa - Alluvial fan deposits deposited onto Pleistocene and Pliocene? age alluvium and landslide deposits (Pleistocene/Pleistocene and Pliocene?)

Qia/QTa - Intermediate alluvial fan deposits (Pleistocene) overlies alluvium and landslide deposits (Pleistocene/ Pliocene?) A thin sheet, less than 2 meter thick, layer of intermediate alluvial fan deposits ([Qia](#)) overlies alluvium and landslide deposits ([QTa](#)).

Qif - Intermediate fluvial deposits (Pleistocene)

Sand, gravel, and mud of Raft River depositional system. Weak pavement on surface. Defining characteristic is gray mud beds that are compositionally similar to rock flour carried by glacial streams. Suggests deposits are contemporaneous with glacial activity in the Raft River Mountains. Mud lies on well sorted pebble to cobble gravel. Bt and calcic (stage II) horizons in upper part of deposit distinguish it from younger fluvial deposits.

Qoa - Older alluvial fan deposits (Pleistocene)

Medium-brown, gravelly sand deposited mainly as alluvial fans, but including colluvium in steeper upland areas. Cobbles and boulders form an erosional pavement on rounded crests of deposits;

clasts typically composed of quartzite. Sand and loam derived from disintegrated granite and quartz in most places. Unit displays well-developed calcic horizon, where surface not strongly eroded, including more than 1.4 m thickness of stage IV calcic soils likely to be several hundred thousand years old. Because deposits are highly eroded, geomorphology not clearly connected to modern sources (mountains) and sinks (valley bottoms). Thickness of unit 15 to 25 m.

Qof - Older fluvial deposits (Pleistocene)

High terrace adjacent to Raft River, composed of rounded clasts derived from upstream mixed with less rounded clasts of adjacent alluvium. Loess cap greater than 1 m thick. Soils not observed; unit may be younger than unit [Qoa](#).

QTa - Alluvium and landslide deposits (Pleistocene and Pliocene?)

Light-colored boulder and gravel deposits typically forming high hills that represent eroded high terraces. Commonly mantled by rounded boulders as large as 1 m diameter and derived from Elba Quartzite. Deposits south of Smokey Mountain and south of Twin Sisters contain huge boulders (as large as 5 m diameter) that are not obviously derived from present topography; probably formed by gigantic landslides from old mountains considerably different from current geomorphology. Deposits generally thicker than 10 m; may be as thick as 25 m.

QTf - Fluvial deposits (Pleistocene and Pliocene?)

Brown sand, gravelly sand, gravel, and silt underlying rounded terraces southeast of Almo and in the southeast corner of the Almo quadrangle. Southeast of Almo, unit has thin, nearly flat bedding, common cross-lamination. Sand and silt beds very well sorted; gravelly beds moderately sorted. Parallel thin bedding and sorting of beds in deposit suggest fluvial origin. Gravel source is granite and quartzite of southern Albion Mountains. Capped by wind-blown(?) fine brown sand 1 to 2 m thick in many exposures; sand overlies stage III or stage IV calcic soil. Deposit underlies a composite surface that dips gently toward Raft River, but is incised by the river. Late Pleistocene alluvial deposits lie on incised surfaces cut into fluvial deposits; relation indicates that fluvial deposits are much older. Thickness greater than 10 m. In southeast corner of map, unit is moderately indurated gravel whose clasts were derived from the Raft River Mountains.

Tr - Rhyolite (Miocene)

Bright red to brownish red or, less commonly, gray, resistant welded rhyolite tuff. Medium-size (3-6 mm diameter) grains of smoky quartz (2 to 3%) and sanidine (6 to 10%) indicate rhyolite composition. Black vitrophyre near base and locally at top. In well-exposed outcrops, central unit shows distinctive large (2 x 8 cm) flattened vesicles and is abruptly overlain by dense, highly flattened rhyolite containing strongly stretched fiamme (pumice blocks). Welded tuff contains sparse lithic fragments of granite as large as 1.5 cm diameter. Overlain by alluvium and landslide deposits ([unit QTa](#)). Deposit is 9 m thick in Emigrant Canyon and 17 to 20 m thick southeast of Trail Creek. Similar rhyolite lying on metamorphic rocks farther north in Albion Mountains dated by Armstrong (1976) at 8.8 million years.

Ts - Sedimentary deposits (Miocene)

Light brown, slope-forming unit consisting of cobbly sand. Clasts are from the Almo pluton and Elba Quartzite; latter more abundant by factor of ten. Clasts commonly as large as one meter diameter; a few as large as 4 m. Overlies Almo pluton and older rocks; overlain by rhyolite. Unit is 5 to 10 m thick at most, tapering to zero northeastward on ridge southeast of Trail Creek.

Tg - Granite (Oligocene)

White to light-gray, medium-grained, subequigranular, granite forming the Almo pluton. Ranges from biotite granite containing 10 to 12% biotite and no other characterizing minerals, to biotite-muscovite granite, to muscovite granite containing 12% muscovite, to muscovite granite containing as much as 5% red garnet. Quartz is light gray, generally about 30% of rock. Typically massive, but locally is layered due to mineral accumulations that form alternating light and dark bands. Pegmatite-aplite dikes are common; most are muscovite-bearing, and a few contain garnet as well. Some joint surfaces coated by muscovite selvages. Roughly zoned from muscovite granite near center of pluton outward to biotite granite, but many reversals and irregularities occur. Typically intrudes Archean rocks along east side of pluton as a series of parallel light-colored dikes that dip moderately to the east and northeast over a zone as wide as 500 m. Dated by Armstrong (1976) at 28.6 ± 1.0 Ma by the Rb-Sr method. Unit includes small stocks of fine to medium grained biotite granite and granodiorite in Emigrant Basin area.

Op - Metamorphosed Pogonip Group (Ordovician)

Brown to bluish gray coarse calcite marble in narrow band of outcrops near head of Emery Canyon and southwest of the Twin Sisters. Brown color generally associated with micaceous marble, gray with pure marble. Represents metamorphosed clean and silty limestone, minor dolomite. Minerals include calcite, dolomite, and phlogopite. Unit 10 m thick.

Zmp - Schist of Mahogany Peaks (Neoproterozoic)

Black coarse-grained pelitic schist. Mapped north of Emery Canyon in stope blocks; elsewhere, included with underlying unit. Age follows assignment by Wells and others (1998).

Zcb - Quartzite of Clarks Basin (Neoproterozoic)

Silvery white, light gray, and tan, very thinly layered flaggy quartzite with micaceous parting seams. Typically exhibits small folds. Where mapped adjacent to Pogonip Group marble south of Emery Canyon and southwest of the Twin Sisters, unit includes 2 to 5 m thickness of the Schist of Mahogany Peaks. Unit 20 m thick. Age follows assignment by Wells and others (1998).

Zss - Schist of Stevens Spring (Neoproterozoic?)

Brown to silvery brown, coarse-grained pelitic schist. Typically has a wavy, silvery foliation that locally has knobby texture caused by muscovite, sillimanite, and biotite wrapped around porphyroblasts of garnet, andalusite, and biotite. Locally, 2- to 7-cm-wide lenses or discs containing kyanite are preserved. Distinctive amphibolite present locally, generally near the base of unit. Unit about 300 m thick. Age follows assignment by Wells and others (1998).

Zy - Quartzite of Yost (Neoproterozoic?)

White, thinly layered, pure quartzite. Contains only sparse muscovite layers. Locally has pronounced green tint. Unit 40 m thick. Age follows assignment by Wells and others (1998).

Zun - Schist of the Upper Narrows (Neoproterozoic?)

Light- to dark-brown and grayish-brown, fine-grained, thinly layered, quartz-rich muscovite-biotite schist and schistose quartzite. Where little deformed, thinly layered aspect suggests unit could have been derived from laminated fine sandstone and siltstone. Quartzite layers are white to pale brown, generally 2 to 12 cm thick. Schist commonly contains veins and stringers of quartz and feldspar. Pure

limestone marble within unit is present west of Indian Grove. Contains a few coarse grained quartzite beds near base. Epidote and actinolite minerals locally present in a stoped block in Almo pluton, and near base of unit at Indian Grove. Unit about 70 m thick. Age follows assignment by Wells and others (1998).

Ze - Elba Quartzite of Armstrong (1968) (Neoproterozoic?)

White to pale gray and grayish brown, thick bedded quartzite. Lower part contains fairly abundant white, yellow, and bluish gray vitreous quartzite beds; upper part contains darker colored thick beds that are less pure than quartzite in remainder of unit. Zone of conglomerate generally separates lower and upper parts. Quartzite beds commonly show tabular cross-lamination. Schist interbeds very close to top are lithologically similar to the Schist of Upper Narrows. Elba typically underlies high ridges because it is resistant to erosion. Nonconformably overlies Archean rocks; muscovite schist commonly marks the contact, and represents metamorphosed argillaceous soil. Unit is about 200 m thick. Age follows assignment by Wells and others (1998).

Wga - Amphibolite of the Green Creek Complex of Armstrong and Hills (1967) (Archean)

Black, coarse- to medium-grained, hornblende-plagioclase and hornblende-plagioclase-garnet mafic rock. Contains minor quartz. Forms linear, dark bands a few meters to tens of meters wide in granite ([unit Wgg](#)) of the Archean complex, relations we take as indicating it intruded granite as dikes.

Wgg - Granite and granite gneiss of the Green Creek Complex of Armstrong and Hills (1967) (Archean)

Light- to dark-gray, coarse-grained, porphyritic biotite granite. Microcline phenocrysts as large as 5 x 2 cm in a medium- to coarse-grained matrix of quartz, biotite, and plagioclase. Phenocrysts typically aligned as magmatic foliation. Biotite about 15 to 20 percent of groundmass. Where deformed to gneiss, phenocrysts are stretched to augen porphyroblasts in fine groundmass. Dated at about 2.5 billion years old by Armstrong and Hills (1967). Equivalent to Adamellite of Compton (1972).

Wgs - Schist of the Green Creek Complex of Armstrong and Hills (1967) (Archean)

Dark-brown, coarse-grained muscovite-biotite schist and related rocks. Schist is biotite rich; typically contains veins, stringers, and knots of quartz and feldspar. Unit includes minor amounts of fine-grained quartzo-feldspathic rocks. Intruded by granite ([unit Wgg](#)). Equivalent to Older Schist of Compton (1972).

The geologic cross sections present in the GRI digital geologic-GIS data produced for City of Rocks National Reserve, Idaho (CIRO) are presented below. Cross section graphics were scanned at a high resolution and can be viewed in more detail by zooming in (if viewing the digital format of this document).

[illegible][illegible]

2021 NPS Geologic Resources Inventory Program

Ancillary Source Map Information

The following section present ancillary source map information associated with source map used for this project.

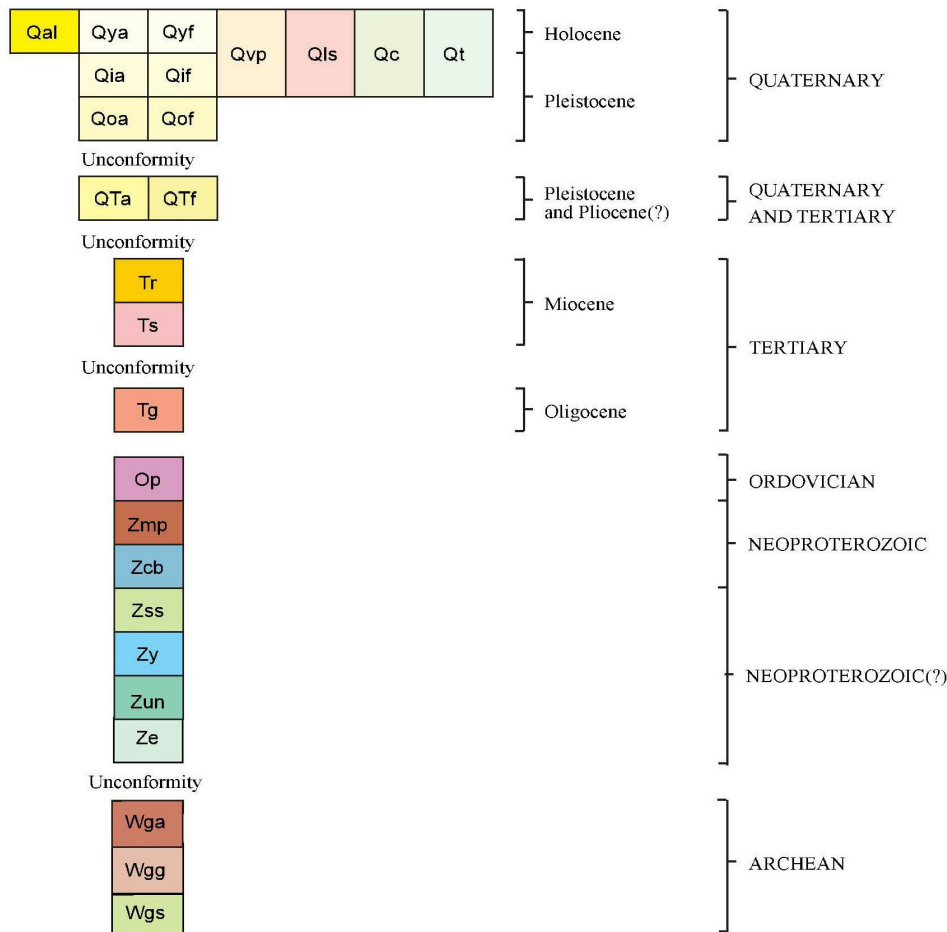
Almo Quadrangle and City of Rocks National Reserve

The formal citation for this source.

Miller, D.M., et. Al., 2008, Preliminary Geologic Map and Digital Database of the Almo Quadrangle and City of Rocks National Reserve, Cassia County, Idaho: U.S. Geological Survey, Open-File Report 2008-1103, scale 1:24,000 (*GRI Source Map ID 4154*).

Prominent graphics and text associated with this source.

Correlation of Map Units



Graphic from source map: [Almo Quadrangle and City of Rocks National Reserve](#)

Map Legend

	Reserve boundary
	contact, certain
	fault, certain
	fault, concealed, queried
	fault, queried
	lineament
	map boundary
	landslide scarp
	lineation
	bedding
	foliation
	vertical foliation and bedding

Graphic from source map: [Almo Quadrangle and City of Rocks National Reserve](#)

Map Location



Graphic from source map: [Almo Quadrangle and City of Rocks National Reserve](#)

References

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References from source map: [Almo Quadrangle and City of Rocks National Reserve](#)

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The information in this document was compiled from the GRI source map, and is intended to accompany the digital geologic-GIS map and other digital data for City of Rocks National Reserve, Idaho (CIRO) developed by Greg Mack, James Winter, and Stephanie O'Meara (Colorado State University) (see the [GRI Digital Map and Source Map Citation](#) section of this document for all sources used by the GRI in the completion of this document and related GRI digital geologic-GIS map).

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