

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



# Booker T Washington National Monument

## *GRI Ancillary Map Information Document*

Produced to accompany the Geologic Resources Inventory (GRI) Digital Geologic  
Data for Booker T Washington National Monument

bowa\_geology.pdf

Version: 5/25/2021

# Geologic Resources Inventory Map Document for Booker T Washington National Monument

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## Geologic Resources Inventory Map Document



# Booker T Washington National Monument, Virginia

## Document to Accompany Digital Geologic-GIS Data

[bowa\\_geology.pdf](#)

Version: 5/25/2021

This document has been developed to accompany the digital geologic-GIS data developed by the Geologic Resources Inventory (GRI) program for Booker T Washington National Monument, Virginia (BOWA).

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 Maps and Source Citations** – A listing of all GRI digital geologic-GIS maps produced for this project along with sources used in their completion. In addition, a brief explanation of how each source map was used is provided.
- 3) **Map Unit List** – A listing of all geologic map units present on maps for this project, generally listed from youngest to oldest.
- 4) **Map Unit Descriptions** – Descriptions for all geologic map units. If a unit is present on multiple source maps the unit is listed with its source geologic unit symbol, unit name and unit age followed by the unit's description for each source map.
- 5) **Ancillary Source Map Information** – Additional source map information presented by source map. For each source map this may include a stratigraphic column, index map, map legend and/or map notes.
- 6) **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](http://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 Citations

The GRI digital geologic-GIS map for Booker T Washington National Monument, Virginia (BOWA):

### **Digital Geologic-GIS Map of Booker T Washington National Monument and Vicinity, Virginia (GRI MapCode BOWA)**

The map was produced from the following sources. A brief explanation of how each source was used is also provided.

Campbell, Elizabeth V. M. et. al., 2001, Digital Spatial Data for a portion of the Roanoke, Virginia: 1:100,000 30' x 60' Quadrangle - Hardy, Goodview, Redwood, Moneta SW 7.5' Quadrangles: VGDMR, unpublished digital data, scale 1:100,000 (Portions of the Roanoke 30' x 60' Quadrangle (digital data)). (*GRI Source Map ID 74611*).

The full extent of the source digital data was used and all geologic features were captured.

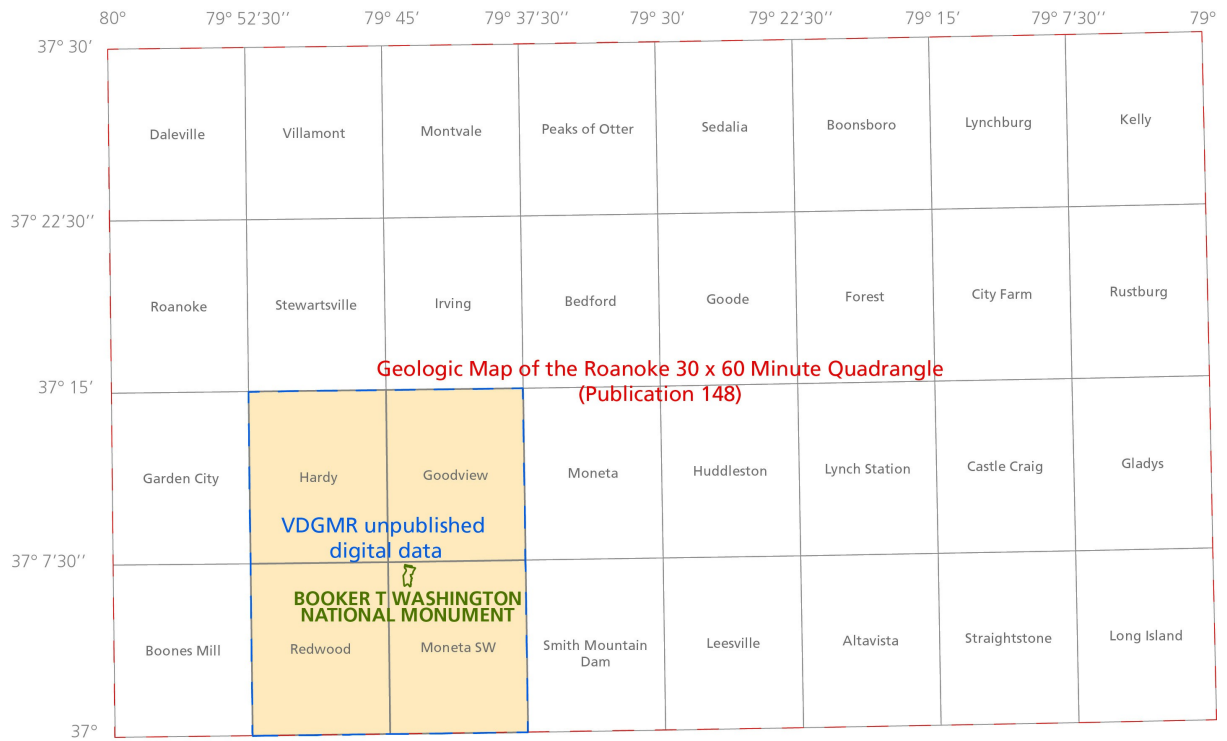
Henika, W.S., 1997, Geologic Map of the Roanoke 30 x 60 Minute Quadrangle: Virginia Division of Geology and Mineral Resources, Publication 148, scale 1:100,000 ([Roanoke 30' x 60' Quadrangle](#)). (*GRI Source Map ID 2395*).

Only a partial extent of the source map was used and only a subset of geologic features were captured.

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

## Index Map

The following index map displays the extent of the GRI digital geologic-GIS map produced for Booker T Washington National Monument (BOWA), shaded in tan. The boundary for Booker T Washington National Monument (as of May 2021) is outlined in green. The dashed red line indicates the extent of the Geologic Map of the Roanoke 30 x 60 Minute Quadrangle (Publication 148). The dashed blue line indicates the extent of unpublished digital data produced by the Virginia Division of Geology and Mineral Resources. Only the extent of these two source maps within the shaded tan region were used in this project.



Index map by James Winter and Lucas Chappell (Colorado State University).



## Map Unit List

The geologic units present in the digital geologic-GIS data produced for Booker T Washington National Monument, Virginia (BOWA) are listed below. Units are listed with their assigned unit symbol and unit name (e.g., Jd - Igneous dikes and sills). 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 (BOWAUNIT) 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.

### Mesozoic Era

#### Jurassic Period

[Jd](#) - Igneous dikes and sills

### Proterozoic Eon to Paleozoic Era

[PZPRmy](#) - Mylonite gneiss

### Paleozoic Era

#### Cambrian Period

[Cu](#) - Unicoi Formation, upper part

### Proterozoic Eon to Paleozoic Era

#### Proterozoic Eon to Cambrian Period

[CZmi](#) - Amphibolite

[CZmy](#) - Alligator Back Formation, laminated mica gneiss (metagraywacke)

[CZas](#) - Alligator Back Formation, actinolite schist (metabasalt)

### Proterozoic Era

[Zam](#) - Ashe Formation

[Zgd](#) - Lovingston massif, granitic gneiss

[Zmg](#) - Lovingston massif, Moneta Gneiss

[Ypg](#) - Pedlar massif, layered gneiss and granulite

[Yma](#) - Lovingston massif, augen and flaser gneiss

[Ybg](#) - Lovingston massif, biotite-granitoid gneiss

[Yc](#) - Lovingston massif, charnockite

[Yhm](#) - Lovingston massif, biotite granitoid

[Ygb](#) - Lovingston massif, biotite granofels and gneiss

## Map Unit Descriptions

Descriptions of all geologic map units, generally listed from youngest to oldest, are presented below. All unit descriptions were taken from [Roanoke 30' x 60' Quadrangle](#)

### **Jd - Igneous dikes and sills (Jurassic)**

#### **d - Igneous dikes and sills (Jurassic)**

Basalt, diabase, and gabbro: dark-greenish-gray to black, fine- to coarse-grained, aphanitic, intergranular, subophitic to hypidiomorphic-granular textures, chilled margins common.

### **PZPRmy - Mylonite gneiss (Late Proterozoic to Paleozoic)**

#### **Pzmy - Mylonite gneiss (Late Proterozoic to Paleozoic)**

Dark-gray to dark-grayish-green, poorly- to well-foliated, fine- to medium-grained, porphyroclastic protomylonite, mylonite, and light-gray, siliceous ultramylonite and phyllonite in local, 10 to 20 foot zones. Mylonite developed during Paleozoic deformation of Middle to Late Proterozoic Basement rock units.

### **Cu - Unicoi Formation, upper part (Cambrian)**

Upper part; quartz pebble conglomerate, greenish-gray, purple and white, three to five very-thick-bedded ledges with some coarse-grained, purplish-gray, ferruginous sandstone locally prospected for iron near the top of the formation. Lower part, metasilstone and meta-arkose, pinkish gray to dark-greenish-gray, fine- to coarse-grained, locally conglomeratic, spheroidal weathering, gradational contact with metamorphosed regolith formed on Middle Proterozoic gneiss. Thickness: estimated 1000 to 1400 feet.

### **CZmi - Amphibolite (Late Proterozoic (Iapetan) to Cambrian)**

#### **CZmi - Amphibolite (Cambrian to Late Proterozoic (Iapetan))**

Amphibolite, dark-greenish to black, coarse-granoblastic, intergradational with greenish-gray, fine-grained, nematoblastic chlorite-amphibole schist, ultramafic schist, or soapstone in complex metamorphosed stratiform igneous plutons.

### **CZmy - Alligator Back Formation, laminated mica gneiss (metagraywacke) (Late Proterozoic (Iapetan) to Cambrian)**

#### **CZmy - Alligator Back Formation, laminated mica gneiss (metagraywacke) (Cambrian to Late Proterozoic (Iapetan))**

Medium- to light-gray, fine- to medium-grained, mica schist, quartzite, calc-gneiss, graphitic phyllite, marble, blue-quartz-granule and metaconglomerate beds; thin partings of dark-greenish-gray, actinolite schist (metabasalt).

### **CZas - Alligator Back Formation, actinolite schist (metabasalt) (Late Proterozoic (Iapetan) to Cambrian)**

#### **CZas - Alligator Back Formation, actinolite schist (metabasalt) (Cambrian to Late Proterozoic (Iapetan))**

Dark-greenish-gray to light-yellowish-green. quartz-epidote granofels, tuffaceous meta-sandstone layers with thin interlayered quartz-mica phyllite, quartzite, metagraywacke, talc-silicate beds, and lens-shaped deposits of white and pink marble. Alligator Back units are probable off-shore equivalents of metabasalt, metarhyolite and arkose in the Catoclin Formation to the northeast.

### **Zam - Ashe Formation (Late Proterozoic (Iapetan))**

Biotite gneiss and schist, medium- to light-gray, coarse- to very coarse-grained, thick-bedded to structureless. Conglomeratic with feldspar, quartz, and granitic clasts probably equivalent to the Rockfish Conglomerate to the northeast along the margin of the rift; grades upward into medium- to fine-grained, salt and pepper textured, two-mica plagioclase gneiss with mica schist interbeds. Intergradational along strike with metavolcanic rocks of an Iapetan rift basin (Moneta Gneiss).

### **Zgd - Lovington massif, granitic gneiss (Late Proterozoic (Iapetan))**

Medium-gray or pinkish-gray, medium- to coarse-grained, poorly-foliated to massive, biotite or hornblende granitoid; gradational to medium-gray, fine to medium-grained mylonite gneiss near sheared pluton contacts.

### **Zmg - Lovington massif, Moneta Gneiss (Late Proterozoic (Iapetan))**

Black and white banded, medium-to fine-grained, weathers moderate-olive-brown to dusky-yellowish-green; interlayers of dark-greenish-gray to black and white amphibolite, light-gray, fine-grained quartz-feldspar gneiss (felsitic tuff-breccia), feldspathic metaconglomerate, mica schist, and abundant, coarse-grained granite dikes and sills (pegmatites), that were mined in the Moneta-Bells feldspar mining district of Bedford County ([Pegau, 1932](#)); intergradational along strike with conglomeratic biotite gneiss and schist of the Ashe Formation.

### **Ypg - Pedlar massif, layered gneiss and granulite (Middle Proterozoic (Grenville))**

Medium- to dark-greenish-gray, fine- to medium-grained, massive granofels to segregation-layered, garnet-pyroxene-quartz-feldspar-rock surrounding plutons and as xenoliths in Grenville and Iapetan intrusive suites; gradational to greenish-gray mylonite and mylonite gneiss along ductile deformation zones separating major plutonic units; correlated with the Lady Slipper granulite gneiss unit, zircon dated at 1130 ma ([Sinha and Bartholomew, 1984](#)).

### **Yma - Lovington massif, augen and flaser gneiss (Middle Proterozoic)**

Light- to medium-gray, mesoscopically layered, medium- to coarse-grained muscovite-biotite gneiss that contains polycrystalline quartz-feldspar augen within an anastomosing mica-rich, schistose matrix.

**Ybg - Lovington massif, biotite-granitoid gneiss (Middle Proterozoic)**

Medium- to dark-gray, medium- to coarse-grained, containing prominent relict subhedral to augen-shaped monocrystalline alkali feldspar phenocrysts.

**Yc - Lovington massif, charnockite (Middle Proterozoic)**

Dusky-green, mesocratic, medium- to coarse-grained, hypidiomorphic granular to porphyritic, massive to foliated, orthopyroxene-bearing granitoid; includes southeastern part of Peaks of Otter Charnockite Suite and charnockite of the Turkey Mountain Suite of [Bartholomew and Lewis \(1984\)](#).

**Yhm - Lovington massif, biotite granitoid (Middle Proterozoic)**

Medium- to dark-gray, coarse-grained to porphyritic, gradational into dark-gray, well-foliated, biotite-granitoid gneiss, protomylonite and mylonite gneiss; includes Horsepen Mountain Suite ([Bartholomew, 1981](#)) and the Biotite Granitoid of the Turkey Mountain Suite ([Bartholomew and Lewis, 1984](#)).

**Ygb - Lovington massif, biotite granofels and gneiss (Middle Proterozoic)**

Light-gray, to dark-grayish-green, medium- to coarse-grained, metamorphic segregation-banded, amphibolite grade rocks with localized enclaves of older relict granulite assemblage; garnet and hornblende common, green, uralitic amphibole, and opaque mineral assemblage in green mylonite gneiss common along major shear zones.

## Ancillary Source Map Information

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

No additional information for Portions of the Roanoke 30' x 60' Quadrangle (digital data) was provided.

### Roanoke 30' x 60' Quadrangle

The formal citation for this source.

Henika, W.S., 1997, Geologic Map of the Roanoke 30 x 60 Minute Quadrangle: Virginia Division of Geology and Mineral Resources, Publication 148, scale 1:100,000 (*GRI Source Map ID 2395*).

Prominent graphics and text associated with this source.

## Key

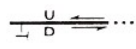
### Contacts, Faults, and Folds

#### CONTACTS

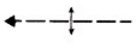
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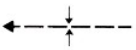
..... covered or inferred


#### FAULTS

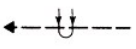
 T- overthrust side; u- upthrown side, d- downthrown side, arrows give sense of strike-slip movement; solid line, exposed or approximate; dashed line, covered or inferred.

#### FOLDS

 Antiform drawn on bedding or foliation. Arrow denotes plunge direction.

 Synform drawn on bedding or foliation. Arrow denotes plunge direction.






 Reclined or recumbent anticline drawn on bedding or foliation.

 Reclined or recumbent syncline drawn on bedding or foliation.

Graphic from source map: [Roanoke 30' x 60' Quadrangle](#)

## Linear Features

### LINEAR FEATURES






-  Minor antiform showing direction of plunge.
-  Minor synform showing direction of plunge.
-  Minor fold crenulation showing bearing, plunge and sense of asymmetry.
-  Bearing and plunge of symmetrical (M) style minor fold crenulation.
-  Bearing and plunge of mineral lineation.

Graphic from source map: [Roanoke 30' x 60' Quadrangle](#)












## Attitude Features

### ATTITUDE OF ROCKS

#### Bedding

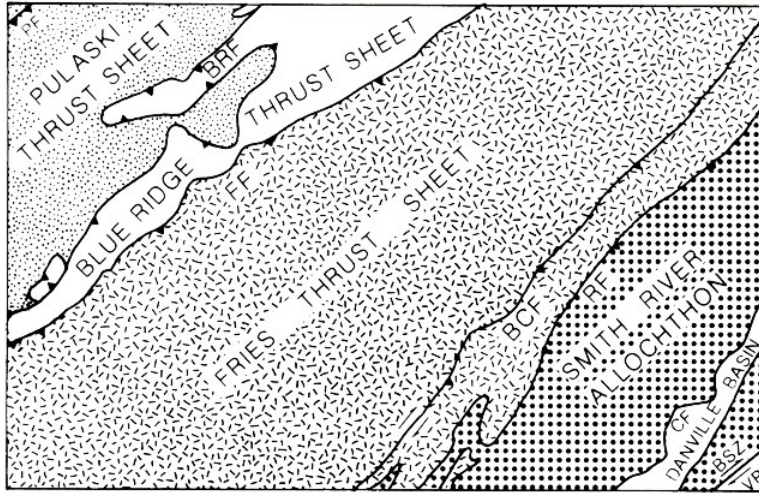
	Strike and dip of beds
	Strike and dip of vertical beds
	Strike and dip of horizontal beds
	Strike and dip of overturned beds
	Strike and dip of beds for which tops are known.

#### Foliation and Schistosity

	Strike and dip of schistosity
	Strike of vertical schistosity
	Horizontal schistosity
	Strike and dip of compositional layering
	Strike of vertical compositional layering
	Strike and dip of quartz vein
	Strike of vertical quartz vein
	Strike and dip of pegmatite dike or sill
	Strike of vertical pegmatite dike or sill
	Strike and dip of minor fault
	Strike and dip of shear bands and kink planes

Graphic from source map: [Roanoke 30' x 60' Quadrangle](#)

## Structural Blocks



STRUCTURAL BLOCKS

Stratigraphic units in the EXPLANATION are arranged by structural block. PF = Pulaski fault; BRF = Blue Ridge fault; FF = Fries fault (Rockfish Valley fault); BCF = Bowens Creek fault; RF = Ridgeway fault; CF = Chatham fault; BSZ = Brookneal shear zone; VP = Central Virginia volcanic-plutonic belt.

Graphic from source map: [Roanoke 30' x 60' Quadrangle](#)

## References Used In Map Compilation

- Bartholomew, M.J., 1981, Geology of the Roanoke and Stewartsville quadrangles, Virginia: Virginia Division of Mineral Resources Publication 34, 23 p.
- Bartholomew, M.J. and Lewis, S.E., 1984, Evolution of Grenville massifs in the Blue Ridge geologic province, Central and Southern Appalachians, *in* Bartholomew, M.J. and others, editors, The Grenville event in the Appalachians and related topics: Geological Society of America Special Paper 194, p. 229-254.
- Bloomer R.O., and Werner, H.J., 1955, Geology of the Blue Ridge in Central Virginia: Geological Society of America Bulletin, v. 66, p. 579-606.
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References from source map: [Roanoke 30' x 60' Quadrangle](#)

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