Map Unit Properties Table: Booker T. Washington National Monument

Colored rows indicate geologic units mapped within Booker T. Washington National Monument

Age	Unit Name (Symbol)	Features and Detailed Geologic Description	Erosion Resistance	Suitability for Infrastructure	Hazards	Cultural Resources	Karst	Mineral Occurrence	Habitat	Geologic Significance and Miscellaneous Notes
JURASSIC	Igneous dikes and sills (Jd)	Unit contains fine- to coarse-grained extrusive basalt, and intrusive diabase and gabbro with dark-greenish-black to black appearance and outcrops. Degree of visible crystallization ranges from aphanitic (indistinguishable), intergranular, subophitic to hypidiomorphic-granular. Chilled margins are common in outcrop exposures.	High	Unit is limited in extent, but could weather to produce shrink-and-swell clays.	Where unit is more resistant that surrounding rock and exposed on a slope, rockfall potential exists.	Glassy pieces of unit may have provided tool material.	None.	Plagioclase, olivine.	Unit may weather to produce iron- and magnesium-rich soils.	Unit records the extensional tectonic environment of the eastern margin of North American throughout the mid-Mesozoic.
PALEOZOIC	Mylonite gneiss (PZZmy)	Unit is part of the Blue Ridge thrust sheet and contains dark-gray to dark-grayish-green protomylonite (least deformed) and mylonite as well as light-gray, siliceous ultramylonite (most deformed) and micaceous phyllonite. Zones of this unit are 3-6 m (10-20 ft) wide and may be poorly- to well-foliated.	Moderate	Unit is associated with deformation zones and will act as zones of anisotropy within country rock exposures.	Heterogeneous nature of unit may render it unstable on exposed, weathered slopes.	None documented.	None.	Unit is highly disseminated, recrystallized country rock.	None documented.	Unit developed during Paleozoic deformation of Middle to Late Proterozoic country (basement) rock units.
CAMBRIAN	Unicoi Formation (Cu)	Unit is part of the Blue Ridge thrust sheet and the Chilhowee Group. Total thickness ranges from 300 to 425 m (1,000 to 1,400 ft). The upper portion of this unit contains quartz pebble conglomerate that appears greenish-gray, purple, and white in outcrops of three to five thick-bedded ledges. Some coarse-grained, purplish-gray ferruginous sandstones present locally. The lower portion of the unit contains metasilstone and meta-arkose that appears pinkish gray to dark-greenish-gray. Lower beds are fine- to coarse-grained, locally contain conglomerate and exhibits spheroidal weathering.	High	Unit would form a strong foundational base unless highly fractured, weathered, and/or exposed on a steep slope.	Unit may be prone to rockfall and topple where undercut by erosion and exposed on ledges and slopes.	Where unit forms ledges and overhangs, American Indians may have taken advantage of natural shelters.	None.	Ferruginous sandstones were locally prospected for iron; conglomerate.	Unit forms prominent ledges that may provide nesting habitat.	Unit is part of the Lovingston massif and has gradational contacts with metamorphosed regolith formed on older, Middle Proterozoic gneiss. Unit contains igneous stratigraphy that indicates several volcanic centers active during the Cambrian.
CAMBRIAN-LATE PROTEROZOIC	Amphibolite (CZmi)	Unit is part of the Lynchburg Group and the Fries thrust sheet. Amphibolite appears dark-greenish to black with coarse granoblastic textures. Amphibolite grades into greenish-gray, fine-grained, chlorite-amphibole schist, ultramafic schist, or soapstone in metamorphosed plutons. Unit crops out in Booker T. Washington National Monument.	Moderate	Heavily altered zones may be points of weakness in units. Due to high shrink and swell clay potential, avoid development of buildings and septic fields on this unit.	Lenses of resistant rocks in schistose layers may be susceptible to block and rockfall. Abundant shrink and swell clay potential exists for weathered portions of this unit.	Soapstone may have provided trade material.	None.	Soapstone, chlorite, amphibole.	Unit may weather to produce calcium-, iron-, and magnesium-rich soils.	Unit is part of the Lovingston massif and contains a record of deformation within the Fries thrust sheet; igneous intrusions; and regional metamorphism.
	Laminated mica gneiss (metagraywacke) (CZmy);	Unit is part of the Alligator Back Formation, Lynchburg Group, and Fries thrust sheet and contains medium- to light-gray mica schist, quartzite, calc-gneiss, graphitic phyllite, marble, blue-quartz-granule and metaconglomerate beds. Textures range from fine- to medium-grained. Dark-greenish-gray actinolite schist occurs in thin partings throughout the unit. Unit crops out in Booker T. Washington National Monument.	Moderate to high for quartzite	Heterogeneous nature of unit may render it unstable on slopes.	Unit may be prone to landsliding where undercut on steep slopes and heavily fractured.	None documented.	Marble may be prone to dissolution, but too localized to be problematic.	Marble, quartzite, actinolite.	None documented.	Unit is part of the Lovingston massif and represents a mixed depositional environment and contains record of regional metamorphism of the Fries thrust sheet. The Alligator Back Formation contains an ophiolite-bearing metasedimentary suite.
	Actinolite schist (CZas)	Unit is part of the Lynchburg Group and consists of dark-greenish-gray to light-yellowish-green, quartz-epidote granofels layered with tuffaceous metasandstone and thin quartz-mica phyllite, quartzite, metagraywacke, talc-silicate beds, and local lens-shaped pods of white and pink marble.	Moderate to high for quartzite	Schistose nature of portions of this unit may be unstable for heavy development. Avoid especially micaceous and/or weathered areas.	If unit is highly weathered and exposed on a slope, landslide potential exists. Radon gas can develop from this unit.	Residual clay from this unit may have been used in local brick making operations.	Marble may be prone to dissolution, but too localized to be problematic.	Marble, talc.	Unit may weather to produce calcium-rich soils	Unit is part of the Lovingston massif and is correlative to off-shore equivalents of metabasalt, metarhyolite, and arkose of the Catoctin Formation to the northeast, deposited after the Grenville Orogeny.

Colored rows indicate geologic units mapped within Booker T. Washington National Monument

Age	Unit Name (Symbol)	Features and Detailed Geologic Description	Erosion Resistance	Suitability for Infrastructure	Hazards	Cultural Resources	Karst	Mineral Occurrence	Habitat	Geologic Significance and Miscellaneous Notes
LATE PROTEROZOIC	Ashe Formation (Zam)	Unit is part of the Lynchburg Group and contains biotite gneiss and schist with medium- to light-gray appearance in outcrop and coarse- to very coarse-grained textures. Unit is nearly structureless. Conglomeratic layers contain feldspar, quartz, and granitic clasts, and grades upward into medium- to fine-grained, two-mica plagioclase gneiss interbedded with mica schist. Unit crops out in Booker T. Washington National Monument.	Moderately high	Foliation and schistosity of unit may render it susceptible to mass wasting processes of exposed on slope parallel to regional fabric.	Unit may be prone to blockfall and topple where resistant conglomerates are undercut on slopes. Metavolcanic rocks can be a source of radon gas.	None documented.	None.	'Salt and pepper' gneiss, feldspar, quartz, mica.	None documented.	Unit is part of the Lovingston massif. Conglomeratic layers may correlate with Rockfish Conglomerate to the northeast. Unit is intergradational along strike with metavolcanic rocks of an Iapetan rift basin (Zmg).
	Granitic gneiss (Zgd)	Unit is part of the Lynchburg Group and contains medium-gray or pinkish-gray, medium- to coarse-grained biotite or hornblende granitoid. Granitoid is poorly foliated to massive and is gradational with medium-gray, fine- to medium-grained mylonite gneiss at sheared pluton contacts.	Moderately high	Suitable for most forms of development unless highly weathered and/or fractured.	Unit may pose blockfall or topple hazard on slopes. Radon gas can develop from this unit.	None documented.	None.	Biotite, hornblende.	None documented.	Unit is part of the Lovingston massif. Unit records deformation accompanying igneous intrusions.
	Moneta Gneiss (Zmg)	Unit is part of the Lynchburg Group and consists of black and white banded gneiss with medium- to fine-grained textures. Weathered outcrops appear olive-brown to yellowish-green. Locally, dark-greenish-gray to black and white amphibolite; light-gray quartz-feldspar gneiss; feldspathic metaconglomerate; and mica schist are interlayered with the gneiss. Abundant granitic dikes and sills present locally.	Moderately high	Schistose, and highly foliated units should be avoided for heavy development due to inherent weakness. Heavily deformed and/or weathered areas are also unsuitable and unstable in deep excavated cuts.	May be susceptible to mass wasting if exposed on slope. Weathered material (saprolite) is susceptible to severe erosion and sedimentation problems if exposed.	Pegmatites were mined in the Moneta-Bells feldspar mining district of Bedford County.	None.	Mica, pegmatite minerals, feldspar.	Unit may weather to produce clay-rich soils.	Unit is part of the Lovingston massif. Unit correlates gradationally with conglomeratic biotite gneiss and schist of the Ashe Formation.
MIDDLE PROTEROZOIC	Layered gneiss and granulite (Ypg)	Unit is part of the Blue Ridge thrust sheet and Lynchburg Group. Unit is composed of massive granofels that appear medium- to dark-greenish-gray in outcrop with fine- to medium-grained textures. Unit also contains layered, garnet-pyroxene-quartz-feldspar rock surrounding plutons and as xenoliths in large intrusive suites. Near deformed areas, unit grades into greenish-gray mylonite and mylonite gneiss.	Moderate	Heterogeneous nature of unit may render it unstable on slopes.	Unit may be prone to landsliding where undercut on steep slopes and heavily fractured.	Garnets may have been source for abrasives or trade material.	None.	Garnet, pyroxene.	Unit may weather to iron-, magnesium-, and calcium-rich soils.	Unit is part of the Pedlar massif. Unit occurs as xenoliths in Grenville and Iapetan intrusive suites. Unit is correlative with the Lady Slipper granulite gneiss unit, with zircon age of 1130 Ma.
	Augen and flaser gneiss (Yma)	Unit is part of the Lynchburg Group and the Fries thrust sheet. Unit is light- to medium-gray, with mesoscopic layers and medium- to coarse grained textures. Dominant rock type is muscovite-biotite gneiss with lesser amounts of polycrystalline quartz-feldspar augen with mica-rich, schistose matrix.	Moderate	Schistose layers may weather preferentially causing instability for heavy development.	Weathering along schistose layers may render portions of this unit unstable and prone to rockfall.	None documented.	None.	Mica, augen.	Unit may weather to produce clay-rich soils.	Unit is part of the Lovingston massif. Unit contains record of deformation and metamorphism within the Fries thrust sheet.
	Biotite-granitoid gneiss (Ybg)	Unit is part of the Lynchburg and Fries thrust sheet and consists of medium- to dark-gray, medium- to coarse-grained gneiss with prominent relict subhedral to augen-shaped monocrystalline alkali feldspar crystals.	Moderately high	Suitable for most development unless highly weathered and/or fractured.	Preferential weathering of less resistant layers may increase likelihood of spalling when unit is exposed on a slope.	Phenocrysts may have provided trade material.	None.	Alkali feldspar phenocrysts.	Unit may weather to produce clay-rich soils.	Unit is part of the Lovingston massif.

Colored rows indicate geologic units mapped within Booker T. Washington National Monument

Age	Unit Name (Symbol)	Features and Detailed Geologic Description	Erosion Resistance	Suitability for Infrastructure	Hazards	Cultural Resources	Karst	Mineral Occurrence	Habitat	Geologic Significance and Miscellaneous Notes
MIDDLE PROTEROZOIC	Charnockite (Yc)	Unit is part of the Lynchburg and Fries thrust sheet and consists of dusky-green, medium- to coarse-grained granitoid rock. In outcrop, this unit may appear massive to foliated and may be granular to porphyritic.	Moderately high	Suitable for most development unless highly weathered and/or fractured. Avoid weathered areas for basements and foundations due to potential radon problems.	May be susceptible to mass wasting if exposed on slope.	None documented.	None.	Orthopyroxene.	None documented.	Unit is part of the Lovingston massif. Unit includes the southeastern part of the Peaks of Otter Charnockite Suite and charnockite of the Turkey Mountain Suite.
	Biotite granitoid (Yhm)	Unit is part of the Lynchburg and Fries thrust sheet and contains medium- to dark-gray, coarse-grained to porphyritic gneiss that grades into dark-gray, well-foliated biotite-granitoid gneiss, protomylonite (less deformed) and mylonite (more deformed) gneiss.	Moderately high	Unit is locally associated with deformation zones and will act as zones of anisotropy within country rock exposures.	Weathered and fractured portions of this unit pose blockfall hazard especially if exposed on a slope.	None documented.	None.	Biotite.	None documented.	Unit is part of the Lovingston massif. Unit includes the Horsepen Mountain Suite and the biotite granitoid of the Turkey Mountain Suite.
	Biotite granofels and gneiss (Ygb)	Unit is part of the Lynchburg and Fries thrust sheet and consists of light-gray to dark-grayish-green amphibolite with medium- to coarse-grained, banded textures. Unit locally grades into relict granulite assemblages. Green mylonite is common within this unit along major shear zones.	Moderate	Unit is locally associated with major shear zones and will act as zones of anisotropy within country rock exposures.	Weathered and fractured portions of this unit pose blockfall hazard.	Garnets may have been source for abrasives or trade material.	None.	Garnet, hornblende, uralitic amphibole, opaque minerals.	None documented.	Unit is part of the Lovingston massif. Unit contains record of early metamorphic conditions overprinted by later, lower grade metamorphism. Shear zones within this unit contain record of deformation events.