Map Unit Properties Table: Stones River National Battlefield

Gray-shaded rows indicate geologic units not mapped within Stones River National Battlefield.

Age	Map Unit (Symbol)	Geologic Description	Geologic Issues	Geologic Features and Processes	Geologic History
ORDOVICIAN	Carters Limestone (Oc)	**Oc** is roughly divisible into three parts: an upper member, an altered volcanic ash (bentonite clay) layer, and a lower member. The upper member is approximately 3 m (10 ft) of very fine-grained to cryptocrystalline (individual grains are indiscernible with the naked eye), medium light-gray to brownish-gray and yellowish-brown limestone. The limestone is present in thin beds and breaks apart in layers, similar to shale or slate. The bentonite is green in fresh exposures, but weathers to white and yellow sticky clay. It is seldom visible in outcrop exposures and is 15–30 cm (6–12 in.) thick. The lower member is approximately 12 m (40 ft) of cryptocrystalline to very fine-grained, medium light-gray to brownish-gray and yellowish-brown limestone. Unlike the upper member, some beds may be coarse-grained and the bedding is medium to thick. Thin lenses of chert are present in the lower member. Erosion resistance is moderate. Mapped only in two very small areas in extreme southwestern corner of map area.	Disturbed lands and landscape restoration—no quarry indicated within **Oc** in mapped area. Karst challenges—unknown, likely similar to those within the park: sinkhole development and flooding, cave development and collapse. Fluvial processes and flooding—unknown, not mapped along waterways in map area. Slope failure and erosion—unknown. Seismicity—low seismic risk.	Karst features—karren, sinkholes, closed depressions, caves, springs possible. Cedar glades—occur on karst terrain throughout central Tennessee. Paleontological resources—marine invertebrates likely. Stones River Group—**Oc** is part of the Stones River Group.	Bentonite (altered volcanic ash) beds in **Oc** reveal that the unit is approximately 455 million years old. Volcanic ash was likely a product of the tectonic unrest associated with the Taconic Orogeny—one of three major mountain-building events that culminated in the Appalachian Mountains. **Oc** was deposited in a long-standing open marine basin present in this area of Tennessee throughout the Ordovician. The depth and extent of this basin fluctuated, particularly due to tectonic unrest to the east and uplift of the Nashville Dome.
	Lebanon Limestone (Olb)	**Olb** is 23–30 m (75–100 ft) of cryptocrystalline to very fine-grained, medium light-gray to brownish-gray and yellowish-brown limestone. Some individual beds of **Olb** may be coarse-grained. The limestone is present in thin beds and breaks apart in a shaly habit; approximately 14 m (45 ft) above the base of the formation is a zone of medium- to thick-bedded limestone. Erosion resistance is moderate. **Olb** is mapped within the Rosecrans Headquarters site.	Disturbed lands and landscape restoration—**Olb** is mapped immediately adjacent to a large quarry operation surrounding the Rosecrans Headquarters site. Karst challenges—sinkhole development and flooding, potential for cave formation and collapse, although no cave is documented from this unit within the park. Potential visitor safety issues associated with karst features. Fluvial processes and flooding—unknown, typically mapped at elevations above major waterways. Rapid runoff typical of karst areas facilitates flooding and water quality issues. Slope failure and erosion—non-karst erosion and slumping primarily an issue on constructed slopes (e.g., bridge abutments). Seismicity—low seismic risk.	Karst features—karren, sinkholes, closed depressions, springs. Cedar glades—occur on karst terrain throughout central Tennessee. Connections to park stories—karst terrain and features greatly impacted troop movement and battlefield tactics. Paleontological resources—marine invertebrates, although none have yet been documented in the park. Stones River Group—**Olb** is part of the Stones River Group. Type section is not located within the park.	Shale beds in this unit were derived from sediments eroding from the uplifting highlands to the east during the Taconic Orogeny. **Olb** was deposited in a long-standing open marine basin present in this area of Tennessee throughout the Ordovician. The depth and extent of this basin fluctuated, particularly due to tectonic unrest to the east and uplift of the Nashville Dome.

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Age	Map Unit (Symbol)	Geologic Description	Geologic Issues	Geologic Features and Processes	Geologic History
ORDOVICIAN	Ridley Limestone (Ord)	**Ord** is 30–45 m (100–150 ft) of cryptocrystalline to very fine-grained, brownish-gray and yellowish-brown limestone. Some individual beds of **Ord** may be coarse-grained. Bedding within this unit tends to be medium to thick. Thin bands and irregular bands of magnesian limestone are present locally, along with lenses of chert. A conspicuous zone of thin-bedded limestone that breaks in a shaly habit occurs 6–11 m (20–35 ft) above the base of the unit. Erosion resistance is moderate. **Ord** is mapped within the main battlefield, Artillery Monument unit, a portion of General Bragg Headquarters site, and nearly all of Fortress Rosecrans.	Disturbed lands and landscape restoration—major quarry operation just outside Rosecrans Headquarters site mapped in **Ord**. Additional quarries throughout mapped area. Disturbed lands from previous debris dumps and other industrial uses within what is now parkland are being restored. Karst challenges—sinkhole development (particularly along tour road and McFadden Lane), sinkhole flooding, collapse and flooding of Rebel Yell Cave. Potential visitor safety issues associated with karst features. Fluvial processes and flooding—erosion and flooding potential where mapped along West Fork Stones River. Mapped areas in park generally not near the river. Rapid runoff typical of karst areas facilitates flooding and water quality issues. Slope failure and erosion—non-karst erosion and slumping primarily an issue on constructed slopes (e.g., bridge abutments). Seismicity—low seismic risk.	Karst features—well-developed karren, Rebel Yell Cave, sinkholes, closed depressions, springs (particularly at contact with **Opm**). Cedar glades—particularly well developed in southern portion of main battlefield unit, underlain by **Ord**. Connections to park stories—karren and cedar glades greatly impacted troop movement and tactics during the battle. The "Slaughter Pen" is one particularly well-described example. Rebel Yell Cave likely provided water for post-war African American settlement. Paleontological resources—marine invertebrates, including coral, cephalopods, gastropods, brachiopods, sponges, bryozoans. Some have been documented within the park. Stones River Group—**Ord** is part of the Stones River Group. Type section is not mapped within park, although the unit is extensively mapped in the main battlefield area.	Sediments from continental sources were less prevalent in the deposition of **Ord** than in that of **Opm**. **Ord** was deposited in a long-standing open marine basin present in this area of Tennessee throughout the Ordovician. The depth and extent of this basin fluctuated, particularly due to tectonic unrest to the east and uplift of the Nashville Dome. The Ridley Limestone represents a transgressive (sea level rise) period in the Middle Ordovician. Water depths were likely less than 60 m (200 ft).
	Pierce and Murfreesboro limestones, undivided (Opm)	The Pierce Limestone is about 8 m (25 ft) of cryptocrystalline to very fine-grained, brownish-gray and yellowish-brown limestone. Some individual beds may be thicker and granular (coarse-grained). The limestone is present in thin beds and breaks apart in a shaly habit. The upper 3–21 m (10–70 ft) exposed of the Murfreesboro Limestone is cryptocrystalline to very fine-grained, medium-gray to medium dark-gray and brownish-black limestone. Unit is medium- to thick-bedded. Thin bands and irregular bands of magnesian limestone are present locally, along with lenses of dark-gray to brownish-black chert. Erosion resistance is moderate. **Opm** is mapped within eastern portion of the Artillery Monument, Redoubt Brannan, and a small area of Fortress Rosecrans.	Disturbed lands and landscape restoration—disturbed lands from previous debris dumps and other industrial uses within what is now parkland are being restored. Karst challenges—sinkhole development and flooding, potential for cave formation and collapse, although no cave is documented from this unit within the park. Potential visitor safety issues associated with karst features. Fluvial processes and flooding—erosion and flooding potential, particularly where mapped along West Fork Stones River. Riprap installed in 1970s to stabilize river banks at Artillery Monument site. Rapid runoff typical of karst areas facilitates flooding and water quality issues. Slope failure and erosion—non-karst erosion and slumping primarily an issue on constructed slopes (e.g., bridge abutments). Seismicity—low seismic risk.	Karst features—karren, sinkholes, closed depressions, springs (particularly at contact with **Ord**). Cedar glades—occur on karst terrain throughout central Tennessee. Paleontological resources—marine invertebrates include bryozoans, brachiopods, ostracodes, and gastropods, although none have yet been documented within the park. Stones River Group—Pierce and Murfreesboro limestones are part of the Stones River Group. Type section for Murfreesboro limestone located north of Murfreesboro, outside of park.	Shale beds in these units were derived from sediments eroding from the uplifting highlands to the east during the Taconic Orogeny. **Opm** was deposited in a long-standing open marine basin present in this area of Tennessee throughout the Ordovician. The depth and extent of this basin fluctuated, particularly due to tectonic unrest to the east and uplift of the Nashville Dome. The Murfreesboro Limestone is exposed along the East Fork Stones River in the park area. Its depositional setting was similar to **Ord**, whereas the Pierce Limestone was deposited in shallower water conditions.