STATEMAP
Altenburg-BG

Bedrock Geology of Altenburg Quadrangle

Jackson County, Illinois and Perry County, Missouri

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Location and Introduction

The Altenburg Quadrangle is located in Jackson County, Illinois and Perry County, Missouri, about twenty-five miles north of Cape Girardeau, Missouri and seventy-five miles southeast of St. Louis, Missouri. The Mississippi River and the Illinois-Missouri state boundary divide the quadrangle. The Illinois side contains moderate bedrock exposures but is dominantly low-lying and covered by alluvium. Two-thirds of the quadrangle lies in Missouri and was mapped by Amos (1985).

The following adjacent quadrangles have been mapped at the 1:24,000 scale: Raddle (Devera 2005), Oraville (Williams et al. 2003), Gorham (Seid et al. 2009), Wolf Lake (Devera 1993), and Altenburg (Missouri side, Amos 1985).

How This Map Was Made

Rock outcrops were systematically located on a topographic base and notes were taken on the Illinois side only. Rocks were well exposed along the Devil's Backbone, Walker Hill and the west side of Fountain Bluff. Contacts were drawn based on lithologic descriptions. Faults were mapped where rock layers increased in dip over a short distance and where inferred from stratigraphic juxtaposition. No boreholes or water well records were used on the Illinois side of the quadrangle. Amos (1985) used 12 deep boreholes and compiled partial or smaller scale geologic maps dating back to 1925 in his mapping of the Missouri portion of the Altenburg Quadrangle.

Stratigraphy

The Backbone Limestone is the oldest unit in the quadrangle on the Illinois side. It occurs at the southern end of the Devil's Backbone ridge in an abandoned quarry. The quarry is the type section of the Backbone Limestone, which is equivalent to the Little Saline Limestone in Missouri. The Clear Creek Chert lies conformably above the Backbone in Illinois but is disconformable in Missouri (Amos 1985). The Grand Tower Limestone (Eifelian) type section occurs as a tiny bedrock island and was thoroughly studied by Devera (1986) and Devera and Fraunfelter (1988). The St. Laurent Formation (Givetian) unconformably overlies the Grand Tower Limestone. Only the lower members of the St. Laurent Formation are exposed along the Mississippi River bank when the water level is low.

The next unit exposed in Illinois is the Salem Limestone. Faulting has removed Upper Devonian and Lower Mississippian units. The Salem Limestone is conformably overlain by the St. Louis Limestone. Many of the Mississippian age formations are present in the subsurface but are covered with thick alluvium at the surface and are described in more detail in the geologic column.

Fountain Bluff is composed of Upper Chesterian sandstones and limestones. The Menard Limestone, Palestine Sandstone, Clore Formation, and Degonia Sandstone are combined into Upper Elviran undivided. Some of the formations are too thin to map at this scale and are better represented as one unit. The Upper Elviran undivided units are unconformably overlain by the Pennsylvanian Caseyville Formation and Lower Tradewater Formation.

Structural Geology

Rattlesnake Ferry Fault Zone, IL (RFFZ) and Ste. Genevieve Fault Zone, MO (SGFZ)

The Rattlesnake Ferry Fault Zone (RFFZ) is the largest fault zone of the greater Ste. Genevieve Fault Zone (SGFZ) and cuts through the southeastern part of the Altenburg Quadrangle. The fault zone trends about N50˚W to N60˚W. The main fault of the RFFZ is a high angle reverse fault (Nelson 1995), with hanging wall up to the southwest. The overlying sedimentary strata are gently to steeply dipping and are draped over a basement fault at depth. Several major fault splays and two minor fault splays occur in the RFFZ. In Walker Hill, the Grand Tower Limestone is juxtaposed with the Salem Limestone with a displacement of 700 to 800 feet, down to the northeast. A fault splay occurs at the south end of the Backbone ridge with 215 to 395 feet of displacement, faulting out the Clear Creek Chert and the Grand Tower Limestone. Another splay occurs in the alluvium between Walker Hill and the Devil's Backbone with 890 to 1,115 feet of displacement, faulting out Devonian formations above the Grand Tower Limestone and Mississippian formations below the St. Louis Limestone. Another splay fault occurs in the alluvium between Fountain Bluff and Walker Hill with 150 to 250 feet of displacement, faulting out Chesterian formations.

The greater Ste. Genevieve Fault Zone has undergone at least two periods of movement (Weller and St. Clair 1928). The first documented movement took place in late Middle Devonian time, during or immediately after deposition of the Grand Tower Limestone and ended during deposition of the New Albany Shale (Upper Devonian black shale, Nelson 1995). Evidence for this movement was stratigraphic, as missing Devonian units beneath Valmeyeran cover indicated as much as 1,000 feet of displacement with the south side down. The second period of deformation took place in late Mississippian-early Pennsylvanian time and had an opposite sense of movement. The Carboniferous movement reversed the Devonian movement and offset the strata 1,250 to 1,760 feet down to the north. Devera and Nelson (1995) documented post-Eocene extensional movements along the RFFZ to the southeast in the Cobden Quadrangle.

The Rattlesnake Ferry Fault Zone is a high angle reverse fault with dominantly dip-slip movement, but the zone may have undergone oblique slip movement throughout its long and complex history. Minor amounts of strike-slip movement along the Ste. Genevieve Fault Zone have been

proposed by Schultz et al. (1992) and Nelson and Lumm (1985) from field evidence and kinematic indicators. En echelon faulting was also documented in the nearby Pomona Quadrangle (Seid et al. 2007) along the Pomona Fault Zone.

Bodenschatz-Lick Fault Zone (BLFZ)
The Bodenschatz-Lick Fault is also called the Bodenschatz-Lick Fault Zone by Nelson (1995) because it is a complex zone of faulting as much as 3.5 miles wide in Missouri (Middendorf et al. 1988, Whitfield and Middendorf 1989). Nelson and Lumm (1985) demonstrated with borehole data that the Bodenchatz-Lick Fault Zone extends northeastward into Illinois. In Illinois, displacements on the Beech Creek Limestone in borehole data yield offsets of 600 feet, down to the southeast (Nelson 1995). The surface trace of this fault can be seen on the Missouri side, where the Aux Vases Sandstone is offset with upper Chesterian formations. The thickness of missing section is about 500 to 600 feet, down to the southeast, which agrees with the results of the borehole study.

The Bodenschatz-Lick Fault Zone is projected into the Altenburg Quadrangle from the Oraville and Gorham Quadrangles and trends about N30˚E to N40˚E. Pennsylvanian strata are faulted at depth and folded into a monocline at the surface in the Oraville Quadrangle (Williams et al. 2003), with the axial trace along the trend of the BLFZ (Nelson 1995).

Economic Geology

Oil and Gas
No oil and gas tests are known on the Illinois side of the Altenberg Quadrangle; however, there could be hydrocarbon potential on the up-thrown side of the Bodenschatz-Lick Fault into the Gorham Quadrangle in the alluvial bottoms. Potential pay zones could be in the Aux Vases Sandstone, Ste. Genevieve Limestone, Warsaw Formation and Trenton (Kimmswick) Limestone intervals.

Industrial Minerals
Limestone for agricultural or construction purposes are present in the quadrangle. There are three abandoned limestone quarries on the Illinois side and three abandoned quarries on the Missouri side. On the Illinois side, one quarry is in the Salem Limestone at the northwest end of Walker Hill. A second is located on the southeast side of the Devil's Backbone ridge in the Backbone Limestone. The third quarry is located in the Grand Tower Limestone on the west-central side of the Devil's Backbone ridge. On the Missouri side, all three abandoned quarries are in the Glen Dean Limestone on the edge of the Mississippi River.

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This map has not undergone the formal Illinois Geologic Quadrangle map review process. Whether or when this map will be formally reviewed and published depends on the resources and priorities of the ISGS.

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