Diabase dike near Lancaster, South Carolina: The "Great Dyke of South Carolina"

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LOCATION

The large diabase dike and adjacent granite that it intruded are well exposed in road cuts along US Highway 601, about midway between Lancaster and Pageland in the northeastern South Carolina Piedmont (Figs. 1 and 2), about 50 mi (80 km) southeast of Charlotte, North Carolina. The outcrop is about 4,000 ft (1,200 m) south of Flat Creek and 0.9 mi (1.5 km) northeast of the village of Midway (intersection of US 601 and South Carolina 903). There is ample parking on the grassy shoulder of the highway just north of the outcrop, large enough even for several buses; in wet weather, be careful of soggy ground.

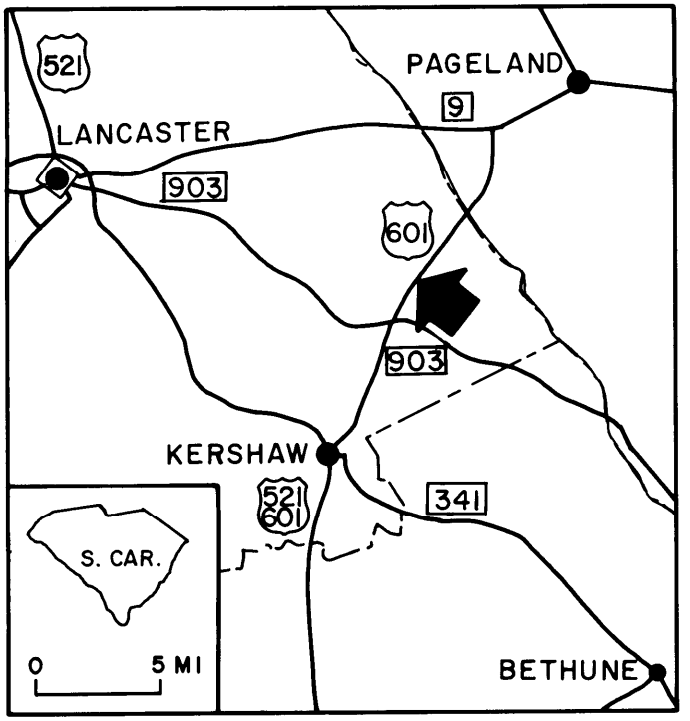

Figure 1. Road map showing locality.

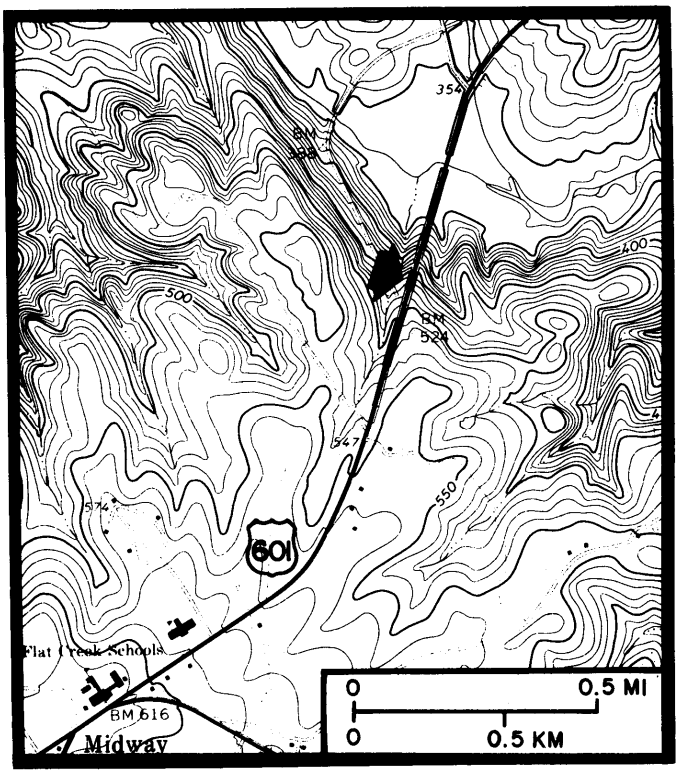

Figure 2. Topographic map showing location of the diabase dike outcrop. Taxahaw 7½-minute Quadrangle.

INTRODUCTION

This large northwest-trending diabase dike is 1,123 ft (342 m) thick, which makes it one of the thickest diabase dikes in the eastern United States. It is part of a province of Mesozoic diabase dikes that extends through much of eastern North America (King, 197 1; Ragland and others, 1983). In the southeastern United States, the dikes dominantly trend northwest, but there is also a group that trends almost north-south (Ragland and others, 1983). At this locality, the dike intrudes granite of the Pageland batholith, which is one pluton in a belt of late Paleozoic intrusions with ages of about 300 m. y. (Fullagar and Butler, 1979). The dike has contact-metamorphosed the adjacent granite. The dike is at the southeastern end of one of the most lengthy swarms in the Appalachian region; dikes extend along strike to the northwest of this locality for 125 mi (200 km) and one crosses the Brevard zone into the Grandfather Mountain window (King, 197 1).

Steele (197 1) chemically analyzed 95 samples from this road cut. The dike is a relatively homogeneous tholeiite with about 53 percent SiO_2, but there are slight modal and chemical variations that are symmetrical about the center of the dike. For example, alumina shows maxima of about 18 percent near each margin, but falls to 16 percent near the center. The dike contains 0.4 to 5.0 percent modal olivine that is extensively replaced by iddingsite (Steele, 1971). In spite of the modal olivine, chemically the dike samples are quartz normative (Steele and Ragland, 1976). This contrasts with most other dikes in the region, which are olivine tholeiites in both norms and modes, containing as much as 20 percent modal olivine (Butler and Howell, 1977). Steele and Ragland (1976) developed a model to explain the variations across the dike in this road cut by two pulses of similar tholeiitic magma, each undergoing some crystal fractionation. Additional information on dikes in this area is given by Butler and Howell (1977), Bell and others (1979), and Ragland and others (1983).

SITE DESCRIPTION

Proceeding southward along the road cut from the parking area, you first see spheroidal boulders of the Pageland granite. These are surrounded by saprolite of the granite. Granite near the dike contact is visibly changed by contact metamorphism into a darker rock that is partly recrystallized. A thin section of a sample taken 6 ft (2 m) from the contact contains augite, a mineral not observed in unmetamorphosed Pageland granite; therefore, the contact aureole probably reached pyroxene-hornfels facies of contact metamorphism.

The granite-dike contact appears as a distinct color change in the weathered rock, from light-colored saprolite of the granite to brownish-red saprolite of the diabase. This road cut was remarkably good when first made in 1966 and was dominantly composed of fresh rock; but weathering, soil creep, slumping, and plant growth are causing rapid deterioration. Proceeding south along the road cut, one passes the other contact of the dike, where the weathering is noticeably more intense. At the south end of the exposure, cross-bedded sands and gravels of the Middendorf Formation (Late Cretaceus) nonconformably overlie weathered granite. Rocks near the nonconformity have been heavily weathered twice, once in the Mesozoic before deposition of the Middendorf Formation and again in the Holocene.

The dike is thickest where it cuts the granite, as at this locality; the diabase narrows to the northwest and is only 115 ft (35 m) thick where it crosses into metavolcanics rocks 1.2 mi (2 km) from here (Butler and Howell, 1977). The dike can be traced only about 5 mi (8 km) northwest of here, but other dikes en echelon and parallel to it are numerous. The dike is covered by Coastal Plain sediments just southeast of this roadcut, but it may continue for at least 9 mi (15 km) beneath the Coastal Plain, based on linear anomalies on aeromagnetic maps (Bell and others, 1979).

The Pageland granite is well exposed at Forty-Acre Rock, which is only 1.2 mi (2 km) north of this road cut. Forty-Acre Rock is a spectacular example of a “flatrock” type of exposure developed on the post-metamorphic granites near the Coastal Plain overlap. To reach Forty-Acre Rock, turn left (north) off US 601 just north of Flat Creek (intersection is visible from the parking area); go 2 mi (3 km) and turn left again onto an unpaved, dead-end road that leads to the exposure. Other field guides to this region are by Bell and others (1974) and by Hatcher and Butler (1979).

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