PRELIMINARY GEOLOGIC REPORT OF THE GREEN RIVER

GEOLOGY

The history and bedrock geology of this portion of North Carolina is by no means well understood. Present concepts about the age of the rocks, their origins (whether igneous or sedimentary), and subsequent metamorphic and deformational history are quite different than those of only a dozen or two years ago. On the basis of the most recent data, it appears that many of the rocks are not nearly as old as previously thought and likely belong to the early Paleozoic or latest Precambrian era; that is from about 350 to 650 million years ago. Although magmatic activity, manifested now by cross cutting igneous and metaigneous rocks, has certainly occurred in the geologic past, many of the rock formations in the area probably had their beginnings as sands and muds deposited in an aqueous environment. Subsequent deep burial and ensuing metamorphism and complex structural deformation have greatly obscured many details; however, our present ideas are that the distribution and attitude of the rocks in the region is controlled by westward-directed thrust sheets or nappe structures which have developed deep in the earth's crust. It is speculated by some that these structures may be the result of regional heating and profound upwelling and plastic-like flowage of the rocks, in part under the influence of gravity, or as others think, the basic cause may involve interactions or 'collisions' on a continental scale of large crustal units.

Reconnaissance geologic observations indicate that most of the bedrock exposures along the course of the Green River between Lake Summit and Lake Adger are of locally migmatitic, layered, medium- to course-grained muscovite-biotite gneiss (mgm on map). In three areas; near Lake Adger around the mouth of Laurel Creek (about 1¼ miles downstream of Mount Valley), and near Lake Summit, other rock types occur. These are grouped on the geologic map under the term "paragneiss and schist"; locally they include garneteriferous muscovite-biotite schist, amphibolite, and biotite granitic gneiss (see fig. 1).

Although there are numerous and complex small-scale tetonic structures within the rocks themselves, scattered observations and extrapolation from other areas of the Piedmont suggest that the paragneiss and schist unit constitutes part of a thrust sheet called the Walhalla nappe and the layered migmatitic gneiss constitutes part of the Six Mile nappe.[1]

In cross section (see fig. 2) rocks of the Six Mile nappe overlie those of the Walhalla nappe along an undulating fault contact. Locally this contact is well exposed at the mouth of Laurel Creek where garnetiferous mica schist at the base of the Six Mile nappe overlies the mica gneiss of the Walhalla nappe. It should be mentioned that although in the geologic past there have been widespread major earth movements, the evidence is that these structures have long been inactive and their presence does not at all imply or constitute any exceptional earthquake hazards.

GEMORPHOLOGY

The boundary between two of the major physiographic provinces of North America crosses the Green River in western Polk County. To the west is the Blue Ridge; to the east is the low-lying Piedmont. The boundary, by definition, is at the base of the mountains; locally it occurs between about 1000 and 1200 feet elevation.

Rising from this elevation to the crest of the mountains is the Blue Ridge front, a steep, rugged escarpment with nearly 2000 feet of relief in the vicinity of Green River. This escarpment provides the setting for a zone of intense erosional activity as ocean-bound streams cascade down from the Blue Ridge creating indentations and deep gorges along the front.

Although several plausible theories have been advanced to explain just why there is so abrupt a change between the two provinces, the question is still far from settled.

[1]The names "Walhalla nappe and Six Mile nappe" are taken from the original works of Hatcher and Griffin (1969) in South Carolina; esistence of similar nappe structures in North Carolina is shown by the detailed work of Lemmon and Dunn (1973).

It is clear, however, that through the action of mass wasting, headward erosion, down-cutting, lateral planation, and stream capture, the Piedmont surface is now enlarging westward as the Blue Ridge becomes dissected and consumed by these vigorous erosional processes.

Between Lake Summit in the Blue Ridge and Lake Adger in the Piedmont, the Green River falls more than 1000 feet as it flows through a narrow, gorge-like canyon. In this stretch the channel has three distince segments:

1) From Lake Summit northeastward to the mouth of the Hungry River,

2) From the mouth of the Hungry River southeastward for about 2 miles to around elevation 1060,

3) From elevation 1060 northeastward to Lake Adger.

We can logically speculate that these three stretches were, in the geologic past, parts of two different drainage systems with the first two segments forming small tributaries to a major river, perhaps the ancestral French Broad, which flowed westward through the Blue Ridge and ultimately to the Gulf of Mexico. The third segment may have been the headwaters of a tributary to a major east-flowing, Atlantic-bound river. This general situation existed perhaps as much as 150 million years ago. As time progressed, one can envision that the Atlantic-bound streams were able to erode headward and capture part of the west-flowing drainage. This action would necessarily have enhanced the erosive power of the capturing stream at the expense of its victim. Through this and related processes, the present day drainage network may have been developed; in the future we may anticipate further adjustments in the stream pattern as the Green River and its tributaries continue extending their influence into the Blue Ridge Province.

MINERAL RESOURCES

At present, there is no mining activity along the Green River between Lake Summit and Lake Adger, nor is there any reason to anticipate any important mineral discoveries

in the vicinity.

Along the north shores of Lake Summit there are several areas which were once mined for zircon and later feldspar; however, none of these deposits are known to be within the study area.

REFERENCES CITED

Hatcher, R. D. and Griffin, V. S., 1969, A Guide to the Geology of Northwestern South Carolina: South Carolina Division of Geology, Geologic Notes, v. 13, p. 86-147

Lemmon, R. E. and Dunn, D. E., 1973, Geologic Map of the Bat Cave Quadrangle, North Carolina: North Carolina Department of Natural and Economic Resources, Mineral Resources Section, GM 202-NE, scale 1:24,000

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EXPLANATION

Paleozoic

cqm — Caesars Head Quartz Monzonite, intrusive, massive gneissic biotite-quartz monzonite and granodiorite, medium-to coarse-grained, variably equigranular to porphyritic.

bgd — Biotite-hornblende granodiorite, intrusive, medium-grained, mesocratic granodiorite and tonalite, weakly foliated; composition varied, mostly biotite rich but commonly also contains hornblende.

Upper Precambrian-Lower Paleozoic

pgs — Paragneiss and schist, composed of interlayered garnetiferous-muscovite-biotite schist, amphibolite, and biotite granitic gneiss.

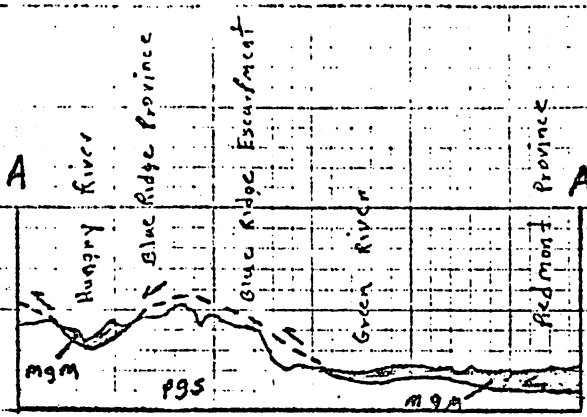
mgm — Migmatitie, layered, medium-to coarse-grained, muscovite-biotite gneiss. Locally migmatitic.

All contacts are approximately located.

All fault contacts are approximately located.

Figure 1. Preliminary geologic map of the Green River area

Figure 2. Structure Section



0 5 miles

4X Vertical exaggeration