FIELD GUIDE
TO THE GEOLOGY AND ARCHAEOLOGY
OF
THE UWHARRIE VOLCANIC BELT
CENTRAL NORTH CAROLINA

by

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INTRODUCTION

The North Carolina Piedmont is an area of metamorphic and plutonic rocks on the west, an area of metasedimentary and metavolcanic rocks in the central portion, and an area of Triassic, Cretaceous and younger Coastal Plain sediments on the east. It is probably one of the least understood geologic provinces in North America (Fig. 1). The central region of metasedimentary and metavolcanic rocks, is the area in which we are interested.

In studying the rocks of the Uwharrie Volcanic Belt (also known as the "Carolina Slate Belt"), geologists hope to interpret the geology of the entire Piedmont. Geologic mapping in the Volcanic Belt has shown that the rocks can be divided into rock stratigraphic units, and can be traced along strike for miles (Conley 1962a, b; Conley and Bain 1965; Mann et. al. 1965; Burt 1967; Stromquist, Choquette, and Sundelius 1966, 1971; Sundelius and Taylor 1968; Seiders 1974; Stromquist and Sundelius 1975).

Archaeologists are interested for a variety of reasons, including the fact that the majority of all stone used by prehistoric man in North Carolina, from Murphy to Manteo, came from the Uwharrie Volcanic Belt. Some stone was preferred over others.

The Uwharrie Volcanic Belt also contains several highly important archaeological sites, such as the Hardaway and Doerschuk sites. These two sites have pieced together the cultural chronology of North Carolina (See Coe 1964). Also, when these two sites are combined with several other sites on the eastern coast, a chronology of the entire east coast can be determined.

The Uwharrie Belt has been a center for mineral exploration since the late 1700's. The first gold discovered in the United States was probably found at Reed's Mine in Cabarrus County, North Carolina in 1799 and systematic mining began in 1802 or 1803 (Stuckey 1965: 295). In addition to gold, copper, lead, silver, zinc, and tungsten have been produced in the belt. Mineral deposits have been described in detail by Laney (1910, 1917), Pogue (1910), Pardee and Parker (1948), and Parker (1963).

LOCATION

The Uwharrie Volcanic Belt extends southwest for more than 400 miles from near Petersburg, Virginia (lat. 37°12' N., long. 77°30' W.), to south of Melledgeville in central Georgia (lat. 33°05' N., long. 83° 15' W.). To the west of the Uwharrie Belt are the medium-grade metamorphic rocks of the Charlotte and Kings Mountain Belts. To the east, rocks of the Uwharrie Belt extend under Cretaceous and younger sediments of the Atlantic Coastal Plain (Siple 1958; Milton and Hurst 1965; Sundelius 1970).

Rocks of the Uwharrie Belt compose much of the eastern Piedmont

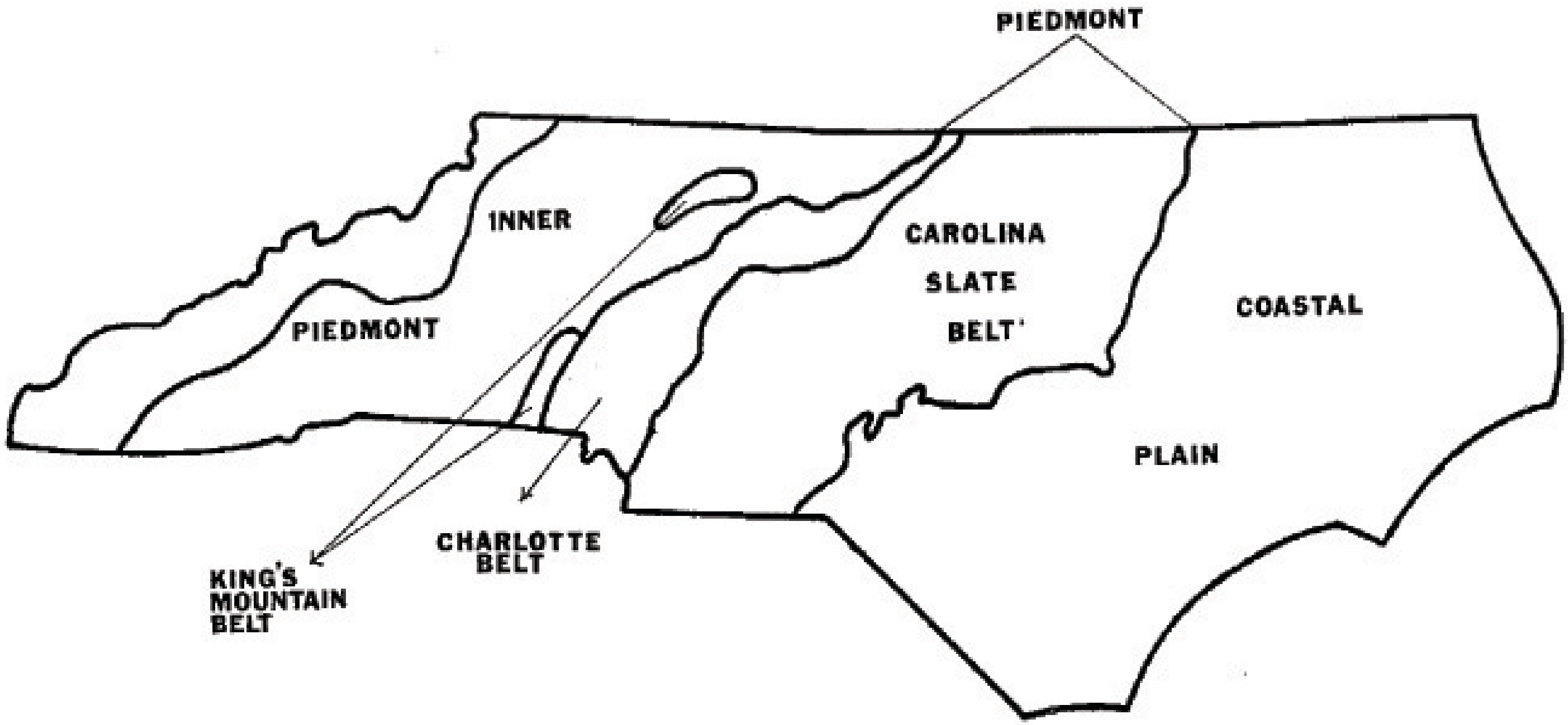

FIG. 1. GEOLOGIC PROVINCES OF NORTH CAROLINA.
'UWHARRIE VOLCANIC BELT

and crop out in two regions. The eastern area is between the southern tip of the Richmond Triassic Basin in Virginia, and Moore County, in south-central North Carolina, where it disappears under the Coastal Plain. The eastern and western parts of this belt are separated to the north by a region of medium-grade metamorphic rocks, and to the south by the Deep River Triassic Basin (Geologic Map of North Carolina 1958).

The areas described herein are concentrated in the Gold Hill, Albemarle, Troy, Asheboro, Denton, and Southmont quadrangles, which cover parts of Rowan, Stanly, Montgomery, Randolph, and Davidson Counties, North Carolina. This area is bounded by latitudes 35°15' and 35°45' N. and longitudes 79°45' and 80°22'30" W.

PURPOSE AND SCOPE

This field trip guide is designed to familiarize both the professional and layman with the Uwharrie Volcanic Belt. Each stop on this field trip shows a different phase of the geologic history of the belt in this area. Some of these stops were used in earlier field trips to the belt (Stromquist and Conley 1959; Seiders and Wright 1977) and are being used today because they represent the best exposure within the area. To the "old-timers" of this belt, several of these stops will be more of a review than anything, but some new research and ideas have been introduced since these rocks were last examined on a field trip.

Not only will this guide examine the most widespread dominant lithologies in the Uwharrie Belt, but will also examine several new and unique things that have been found by this investigator, not appearing in any of the literature. Throughout the course of this tour, ideas and comments would be greatly appreciated.

PREVIOUS INVESTIGATIONS

Geologic investigations have been conducted in the Uwharrie Volcanic Belt since the 1820's. Olmstead (1824) described novaculite, slate, hornstone, and talc from areas now known as the Uwharrie Volcanic Belt. In 1825, he referred to this area as the "Great Slate Formation". Mitchell (1827), Emmons (1856), and Kerr (1875), established the general distribution of the fine-grained slates, speculated about their age, and determined that all of the rocks were of sedimentary origin. Emmons also found what he thought were fossils and named them "Paleotrochis". These were later identified as spherulites by Diller (1899). Emmons recognized both the Troy Anticlinorium and New London Syncline.

Williams (1894) first recognized volcanic rocks in the Uwharrie Belt. Becker (1895) proposed that these igneous rocks were of Algonkian age. Nitze and Hanna (1896) first applied the name "Carolina Slate Belt". This name is not appropriate since little or no slate occurs in this area. They also described volcanic rocks interbedded with the slates, and proposed that the volcanic rocks were laid down during times of volcanic outbursts, followed by inactivity at which time the slates were deposited.

From 1900 to 1917, detailed investigations were made of several major mining districts. Laney (1910) studied the Gold Hill Mining District and divided the rocks into slates with interbedded felsic and mafic tuffs and flows. He also recognized the Gold Hill Fault. Pogue (1910) investigated the Cid Mining District, and described the sedimentary and volcanic rocks in detail. More information covering early investigations are given by Stuckey (1965: 40, 93, 100-101), and Overstreet and Bell (1965: 18, 83-85).

The structure of the Uwharrie Belt near Albemarle, North Carolina, was studied by Bowman (1954). Conley's (1962a, b) mapping of the Albemarle quadrangle and Moore County were the first modern detailed geologic mapping in the area. Bain (1964) studied the general geology in Randolph and Chatham Counties. Butler and Daniel (1974) studied the chemistry of the metasedimentary rocks in the Albemarle area. Mapping by Stromquist, Choquette, and Sundelius (1966) in the Denton quadrangle confirms the stratigraphy established by Conley (1962a, b) and by Conley and Bain (1965). Stromquist and Sundelius (1969) revised part of the stratigraphy of Conley and Bain, not observing a probable angular unconformity that exists between the Albemarle and Tater Top groups.

Burt (1967) did the first geologic mapping in the Troy quadrangle. Upchurch (1968) mapped the southwest quarter of the same quadrangle. Allen and Wilson (1968) mapped Orange County, and described pillow lavas. Butler and Ragland (1969) discussed the petrology and chemistry of the meta-igneous rocks in the Albemarle area. Worthington and Kiff (1970) suggested that the Troy Anticlinorium was a volcanic landmass during the latest Precambrian and Early Paleozoic. Stromquist, Choquette and Sundelius (1971) mapped the Denton quadrangle. Seiders (1974) mapped the Gold Hill, Southmont, Rockwell, and Salisbury quadrangles. Stromquist (in press) mapped the Mt. Pleasant quadrangle to the west of the area covered in this tour.

GENERAL GEOLOGY

In the Albemarle and Troy quadrangles, a sequence greater than 14,000 feet occurs, including sedimentary and volcanic rocks. The Uwharrie Formation, oldest formation thus far recognized in this portion of the volcanic belt, is more than 3,500 feet thick and is mainly felsic volcaniclastic rocks and felsic flows. Much volcanic glass was present before devitrification, and many rocks may be welded tuffs (Butler and Ragland 1969: 701). Most of these rocks suggest a subaerial deposition.

The Uwharrie Formation is overlain conformably by the Albemarle Group. This unit, which is approximately 10,000 feet thick, is composed of generally fine-grained marine clastic rocks, of both volcanic and sedimentary origin. Thin beds of cryptocrystalline devitrified vitric tuff occur in the Albemarle Group and are probably welded tuffs (Conley 1962a: 7; Butler and Ragland 1969: 717). Gabbro intrusions are present throughout this unit (Conley 1962a; Stromquist, Choquette, and Sundelius 1971; Seiders 1974).

The Tater Top Group unconformably overlies the Albemarle Group.

This unit is approximately 450 feet thick and includes andesitic and basaltic pyroclastic rocks and flows overlain by the rhyolite and rhyolitic-dacitic flows and tuffs. These rocks probably represent subaerial deposition.

In the Denton and Gold Hill quadrangles, there are about 22,000 to 25,000 feet of volcanic and sedimentary rocks (Stromquist and Sundelius 1969, 1975). Stromquist and Sundelius use a different terminology than Conley (1962a) or Conley and Bain (1965). The section is apparently the same approximate sequence of the Albemarle Group (Burler and Ragland 1969: 703). Stromquist and Sundelius (1969) also do not show unconformity. Rhyolitic to gabbroic dikes, sills, and batholiths, and Triassic or Early Jurassic dolerite dikes intrude the rocks of the Uwharrie Belt (Conley 1962a; Bell and Wilson 1968; Sundelius 1970). A generalized stratigraphic sequence is shown in Fig. 2.

Fossilized worm casts in volcanic tuff in north-central N.C. have been dated at 620 M.Y.A. (Cloud et. al. 1976) and U-Pb dating of zircon in the Uwharrie Formation provide a date of 580 M.Y.A. (Seiders and Wright 1977) for trilobites from the McManus Formation. Argillite in southern Stanly County has been dated to 565 M.Y.A. (St. Jean 1973), the Morrow Mountain rhyolite unit on Morrow Mountain has been dated by Rb-Sr at 494 ± 14 M.Y.A. (Hills and Butler 1968), with another date of 525 M.Y.A. on possible Morrow Mountain rhyolite in the Troy quadrangle (Hills and Butler 1968). "Coalified" algae has been reported from the Tillery Formation and is believed to be Ordovician in age (Stromquist and Sundelius 1969). A possible regional metamorphism date from U-Pb dating of zircon of 350 M.Y.A. has been derived (Seiders and Wright 1977).

The rocks throughout the area have been deformed into a series of trending open folds (Bowman 1954; Conley 1962a; Stromquist and Conley 1959; Seiders 1974; Stromquist and Sundelius 1975). Intensity of folding increases to the northeast (Stromquist and Conley 1959). Four major fold structures are present in this area. From east to west, they are the Troy Anticlinorium, New London Syncline, Denton Anticline, and the Silver Valley Syncline. To the west of the Silver Valley Syncline is the Gold Hill-Silver Hill Fault zone, generally marking the boundary in this area between the Uwharrie Volcanic Belt and the Charlotte Belt. Two northeast striking shear zones occur in the Tillery Formation on the western side of the Troy Anticlinorium (Conley 1962a: plate 1). These anticlines and synclines are plunging toward the southwest (Conley 1962a; Stromquist, Choquette, and Sundelius 1971; Seiders 1974; Stromquist and Sundelius 1975).

The rocks in the area are of low grade metamorphism but attain the chlorite grade and greenschist facies of regional metamorphism (Stromquist and Conley 1959: 9).

Conley and Bain, 1965

Tater Top Group	Morrow Mountain Rhyolite	Rhyolitic tuffs and flows
Tater Top Group	Badin Greenstone	Andesitic and basaltic tuffs and flows
-----	---ANGULAR UNCONFORMITY---	-----
Albemarle Group	Yadkin Graywacke	Graywacke
Albemarle Group	McManus Formation	Tuffaceous argillites "Vitric" & Mafic tuffs
Albemarle Group	Tillery Formation	Argillites
Uwharrie Formation		Felsic-lithic-crystal tuffs, some flows, rare argillite beds.

Stromquist and Sundelius, 1969

Albemarle Group	Millingport Formation	Yadkin member
Albemarle Group	Millingport Formation	Floyd Church member
Albemarle Group	Cid Formation	Flat Swamp member
Albemarle Group	Cid Formation	Mudstone member
Albemarle Group	Tillery Formation	
Uwharrie Formation		

Fig. 2. Major rock units of the Uwharrie Volcanic Belt, south-central North Carolina (modified after Butler and Daniel 1971).

FIELD TRIP GENERAL INSTRUCTIONS

1. Participants should have received a meal ticket for Saturday lunch at Friday's registration. If you lost the ticket or never received one, please see the excursion leader.

2. Vehicles should have full gas tanks before starting on Saturday morning. The total mileage is 156 miles so one tank of gas should be sufficient for the trip.

3. The field convoy will leave the College-Community Centre at Catawba College promptly at 8:30 AM. Participants and vehicles should reach the Centre in ample time to be in line and ready to go. Those who arrive after the convoy has left, can catch up by following the road log.

4. Since many of the stops are on relatively narrow roads, it is requested that vehicles carry their maximum number of passengers. Vehicles not going on the field trip can be left in parking area #1 (see map) at the Community Centre.

5. Please keep your same position in line throughout this trip. Stay as close behind the car in front as is safely possible. Turn on your lights. At all road intersections, do not turn off until the vehicle behind is in sight. If, for some reason, the vehicle behind does not appear in five (5) minutes, proceed ahead on the route.

6. An average of 15 minutes is allowed at most stops. This is because of the number of stops and length of the tour. On arrival at each stop, please assemble promptly with the excursion leader. He will not begin his talk until the end of the line has caught up. Don't dawdle. You can always come back on your own and stay longer.

7. Any comments and/or ideas at any of these stops will be appreciated. Not only is this a learning experience for the reader, it is a learning experience for the excursion leader. Let us hear your ideas!

ROAD LOG

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0.0 Assembly point: Catawba College Community Centre.

1.8 Salisbury square and Confederate monument. The distant ridge to the right front is Dunn's Mountain.

3.1 Turn left onto Stokes Ferry Road (Co. Rd. 1004).

5.2 McCanless Golf Course on right. Note large granite boulder exhibiting spheroidal weathering. Start up Dunn's Mountain.

5.7 Junction with Dunn's Mountain Road (Co. Rd. 2131). Dunn's Mountain is noted for its granite quarries. Several quarries are located in the woods to the right. This rock is classified as an alaskitic granite and is located in the Salisbury Pluton.

10.5 Junction with St. Peter Church Road (Co. Rd. 2370), straight ahead. Approximately 0.5 of a mile southwest of here, several samples of limestone were found on dumps of an abandoned mine.

12.0 Village of Liberty, turn left onto St. Matthews Church Road (Co. Rd. 2140).

12.3 The convoy has been in the Gold Hill Pluton for the last 3 miles. Its characteristic yellowish-gray sandy residual soil can be easily seen along this road. The rock in this pluton is classified as a quartz monzonite.

14.3 <u>Stop I. Gold Hill Fault:</u>

This roadcut contains one of the best exposures of the Gold Hill Fault. This fault, in this area, marks the boundary between the Charlotte Belt to the west and the Uwharrie Volcanic Belt to the east. Here the quartz monzonite of the Gold Hill Pluton is found in the western half of the exposure, and occupies the upthrown side of the fault. All that remains now is saprolite. Stromquist and Sundelius (1975) have assigned a Post-Ordovician age for this pluton. Siltstone-claystones of the Tillery Formation are exposed in the eastern half of the roadcut. These rocks are also deeply weathered, however, fracturing of the rock can still be observed. Different from the quartz monzonites, the siltstone-claystones develop a maroon-coloured soil. The quartz monzonites develop a lighter coloured soil.

Located approximately 1.4 miles east of here is the Silver Hill Fault. The Gold Hill-Silver Hill Fault zone has metamorphosed the siltstone-claystones into phyllites and schists. Also distributed throughout this shear zone are

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lenses of andesitic-basaltic breccia and gabbro intrusions.

From here the Gold Hill Fault strikes north-northeast, across High Rock Lake, terminating east of Lexington, Davidson County, North Carolina (Privett 1977: 175). Southward from here, the fault runs west of this stop. Butler and Fullagar (1977: 125) have traced this fault into northwestern Lancaster County, South Carolina. They have also estimated the time of movement along this fault at 400-368 M.Y.A.

Turn around and return to Liberty.

16.6 Intersection with Stokes Ferry Road (Co. Rd. 1004), turn left onto Stokes Ferry Road.

17.4 Convoy has just entered the Gold Hill-Silver Hill Fault zone.

18.0 Exposure of sheared siltstone-claystones of the Tillery Formation.

18.4 Cross Panther Creek. This creek follows the Silver Hill Fault.

19.2 Stop 2. Flat Swamp Member of the Cid Formation:

Convoy is now on the northern flank of the Denton Anticline.

The rocks exposed here are fine-to-coarse-grained tuff of the Flat Swamp Member of the Cid Formation (Stromquist and Sundelius 1975). Laminated to blocky crystal and stratified tuffs predominate here. The rocks vary in colour from gray to bluish-gray when fresh, weathering to a silty clay loam. All of these tuffs are rhyolitic to rhyodacitic in composition. Some of the laminated and blocky tuffs contain feldspar fragments as large as 1 mm.

Folding is present on the eastern end of the northern side of the roadcut. On the south side of the road toward the eastern end, a probable normal fault is exposed. The tuffs in the fault zone show no continuity, having been displaced by faulting.

Continue south on Stokes Ferry Road.

19.8 Exposure of fine-grained rhyolitic tuff belonging to the mudstone member of the Cid Formation. These tuffs form small lenses into the unit.

20.15 Pass East Corinth Church on left. The small ridge just ahead is a gabbro intrusion. The convoy is now on the northern flank of the Denton Anticline.

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24.5 The convoy is now passing over the axis of the Denton Anticline. Mudstone of the Mudstone Member of the Cid Formation.

25.5 Cross arm of Tuckertown Lake.

26.2 Enter Stanly County.

26.6 Junction with N.C. 49, turn right (south) onto N.C. 49.

26.7 The convoy is passing through the McManus Formation on the northern edge of the New London Syncline.

27.3 Turn left (southeast) onto N.C. 8.

27.55 This roadcut contains basaltic tuff of the Badin Greenstone unit. The convoy is now on the western flank of the New London Syncline.

28.1 Stop 3. Felsic Tuffaceous-Mafic Tuffaceous Argillite Contact:

(Floyd Church Member: Millingport Formation of Stromquist and Sundelius 1969)

Exposed here is the contact between the felsic tuffaceous argillite to the south, with the mafic tuffaceous argillite to the north. Both of these lithologies belong to the McManus Formation which wraps around the nose of the syncline to the northeast, reappearing on the eastern flank near Badin.

The felsic tuffaceous argillite is coarsely bedded, with beds ranging in thickness from 6 to 24 inches. It is medium gray when fresh, weathering to a light gray and becoming a creamy white when completely decomposed. The rock contains a few feldspar crystal fragments. Wispy particles which might represent devitrified glass sherds appear in some beds, and are in in places concentrated at the base of the beds.

The mafic tuffaceous argillites are difficult to distinguish from the felsic tuffaceous argillites, but on weathering the mafic tuffaceous argillite becomes a recognizable dun brown colour. Individual beds range from 2 to 6 inches thick. At this locality, the tuffaceous argillites strike toward the northeast, and dip 30° toward the southeast. This proves that we are located on the western side of the New London Syncline.

The felsic tuffaceous argillite probably originated as volcanic ash blown into the air, where it was sorted and carried by wind currents, after which it settled into a

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body of quiet water. This is indicated by the excellent sorting, coarse bedding, and the presence of the wispy sherds which have survived reworking (Conley 1962a: 12).

There are two probable source areas for these rocks and associated interbedded "vitric" tuffs (stop 8). Coarse pyroclastic rocks of the Flat Swamp Mountain sequence (also known as the Flat Swamp Member of the Cid Formation) grade both vertically and laterally into the tuffaceous argillites and die out to the south, and the "vitric" tuffs and associated coarser pyroclastics of the McManus Formation also grade vertically into the tuffaceous argillites and die out to the north. These two units of volcanic rocks (McManus and Cid Formations) suggest that there were two active sources during time of deposition of the tuffaceous argillites, one to the south and the other to the north (Conley 1962a: 13).

30.7 Intersection with U.S. 52. Turn left (southeast) onto U.S. 52. Enter New London city limits.

31.1 Stop light in New London, turn left (northeast) onto N.C. 740.

31.8 Saprolite of basaltic tuff with quartz vein.

32.5 Stop 4. Andesitic Tuff of the Badin Greenstone; (Yadkin Member: Millingport Formation of Stromquist and Sundelius 1969).

Similarly to Stop 3, the convoy is on the northern flank of the New London Syncline, however, the axis is now only approximately 2 miles east of here. This stop is located on the northern boundary of an andesitic tuff zone that is concentrated in the area just east of New London. Overlying these tuffs are basaltic tuffs of the Badin Greenstone unit. This stop is interesting since this is the only area in the Albemarle quadrangle where these andesitic tuffs are located. These tuffs unconfomably overlie the Yadkin Graywacke unit, and attain a maximum thickness of 140 feet (Conley 1962a: 8).

At this exposure, the andesitic tuffs are grayish-black when fresh, and develop deep clayey maroon-coloured saprolite. They are massive and bedding can only be seen by observing the flattened pumice fragments and orientation of lithic fragments. The tuffs are spongy in appearance and emit a dull sound when struck with a hammer.

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Since these rocks only occur in an isolate area, they probably originated from nearby fissures. Also, because these rocks have no redated water deposited material, and poor bedding and sorting of the tuff, it suggests a subaerial deposition.

Both the Cotton Patch and Parker gold mines are located in the andesitic tuff. The Cotton Patch Mine is located approximately 1.4 miles southeast of here. The Parker Mine is located approximately .45 of a mile southwest of the center of New London.

Continue east on N.C. 740.

34.2 The convoy is now passing over the axis of the New London Syncline. Yadkin Graywacke occupies the center of the syncline.

34.85 Mafic tuff of the McManus Formation on right.

35.6 Stop 5. Yadkin Graywacke:

(Yadkin Member: Millingport Formation of Stromquist and Sundelius 1969).

The convoy is now located on the eastern flank of the New London Syncline in the Yadkin Graywacke unit. This rock unit overlies the McManus Formation examined at Stop 3, and occupies the center of the New London Syncline. The axis of the structure lies about 1.5 miles west of this stop. West of the axis one can often observe a change of direction of dip of the rocks from northwest to southeast. Here the graywacke is striking northeast, dipping 21^{o} toward the northwest.

At this stop, the graywacke (volcanic sandstone) when fresh, is a dark grayish-green colour, weathering to a light maroon and vermillion saprolite. When completely decomposed, the rock produces a sticky sand clay. It has a massive blocky appearance in outcrop due to the wide spacing (2 to 5 feet) of major bedding and joint planes.

The graywacke exposed here show graded bedding. The matrix varies in composition from the base to the top of the individual graded beds. The base is composed of sand-sized particles, which consist of kaolinite and sericite, and minor amounts of chlorite. The chlorite increases in amount toward the top, which is a silt-sized layer. In this silt-sized layer, chlorite completely replaces the kaolinite and sericite. Pyrite cubes ranging in size from 1/16 inch to over 2 inches occur in this graywacke. Chloritized rock fragments, quartz grains, and some occasional albite

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twinned feldspar laths occur in the graywacke. Argillite fragments are rarely seen in the rock.

The change from the tuffaceous argillites of the McManus Formation to the graywacke indicates a change from volcanic to clastic sedimentation. The source of the graywacke sediments was to the northeast as indicated by rarely seen southwesterly dipping crossbedding and a decrease in particle sizes to the southwest. Several beds of mafic tuff and felsic-lithic tuff interbedded with the graywackes suggest brief periods of volcanic activity during sedimentation. One bed of the mafic tuff occurs .2 of a mile northwest of here. The convoy passed through a larger bed of mafic tuff .75 of a mile west of this stop.

Continue south on N.C. 740.

36.8 Cross bridge over railroad tracks. The west end of bridge rests on mafic tuffaceous argillite. Convoy has just passed from the Yadkin Graywacke into the McManus Formation.

37.8 "Vitric" tuff exposure supporting this ridge.

38.4 Badin Lake on left. At the end of the peninsula to the left is located the Hardaway Site, and archaeological site dating back to at least 11,000 BP.

38.9 Enter Town of Badin, turn left (east) onto Pine Street (Co. Rd. 1719). Follow signs to Morrow Mountain State Park.

39.5 Stanly County Country Club on left. Turn left (south) onto Valley View Road (Co. Rd. 1720). This road follows the contact between the McManus and Tillery Formations. The ridges on the left (east) are underlain by the rocks of the Tater Top Group (basaltic and rhyolitic tuffs and flows).

41.5 Intersection with County Rd. 1798, turn left (east) onto County Rd. 1798.

42.0 Slightly folded argillite of the Tillery Formation on right.

42.12 Convoy has just passed into the Badin Greenstone unit. Boulders of basaltic tuff crop out here.

42.3 Boulders of basaltic tuff.

42.9 Morrow Mountain State Park entrance. A salt lick is located down the dirt road to the left. These "licks" are relatively unknown to both geologists and archaeologists in the southeast.

43.7 Another exposure of the basaltic tuff.

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43.8 Turn left (east) at junction.

44.2 Stop 6. Tillery Formation-Tater Top Group Contact:

Exposed at this stop in only a few hundred yards are rocks belonging to the Tillery Formation, Badin Greenstone, and Morrow Mountain Rhyolite units. Rhyolite flows cap the hills surrounding this stop, as we will see at the next stop. The stream to the right has cut down through the rhyolite exposing the underlying basaltic tuff. This is the farthest east that these tuffs are exposed. This means unconformity exists between the basaltic tuffs and rhyolites of the Tater Top Group, and the basaltic tuffs are eroded away to the east. Presently, field work favors the first of these two.

Several hundred yards east, the rhyolite is exposed unconformably overlying the Tillery argillites. The argillites are steeply dipping; the overlying rhyolite is nearly horizontal, suggesting an angular unconformity. Conley (1962a: 14) lists the evidence for this angular unconformity. Among these are included:

1. Where bedding is observed in both the Tater Top Group and underlying rocks, the Tater Top Group is essentially flat lying, whereas the underlying units dip at fairly steep angles.

2. Rocks of the Tater Top Group occur as erosional remnants capping the highest hills throughout the area. They always occur on the hilltops and can not be traced across major drainage valleys.

3. Hill, not capped by the Tater Top Group, are formed by resistant interbeds which produce elongate northeast trending ridges parallel to regional structure. However, hills capped by the flat lying Tater Top Group are highly irregular in outline and do not exhibit a regional trend.

4. In Morrow Mountain State Park the basal beds of the Morrow Mountain Rhyolite, in most places, are composed of lithic rhyolitic tuff.

5. In many places the basal beds of the basaltic tuffs (Badin Greenstone), which are the lower member of the Tater Top Group, contain rounded cobbles and pebbles derived from the underlying Albemarle Group, indicating erosion of the Albemarle Group before deposition of the Tater Top Group.

The environment of deposition of the rocks belonging to the Tater Top Group represent subaerial conditions. The widespread occurance of the basaltic tuffs, the variation in its composition, and the presence of localized flows near its base, suggest that the basaltic tuffs originated from a number of vents. No pillow lavas or associated clastic sediments have been reported from the Albemarle quadrangle.

6A - argillite outcropping
Tillery Formation
Sedimentary

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erupted from a vent possibly

The underlying pyroclastic rocks of this unit represent a period of ash falls prior to the rhyolite flows. The origin of the Tillery argillites will be discussed at Stop 9.

44.8 Turn right to Park Office and Museum.

45.1 Turn around in parking lot and turn left (west) onto paved road. Return to junction.

45.8 Turn left (south) to Morrow Mountain.

46.6 Exposures of the Morrow Mountain Rhyolite.

47.3 Stop 7. Top of Morrow Mountain:

(Mudstone Member: Cid Formation of Stromquist and Sundelius 1969).

Subaerial - deposited on land

Albemarle Quadrangle

From the last stop to here, the convoy has climbed slightly more than 500 feet, finally reaching the summit which is 900 feet above sea level. Our last stop examined the basal section of the Morrow Mountain Rhyolite unit. Here the rhyolite which caps this rock unit is exposed. These rocks have produced a radiometric date of 494 ± 14 million years (Hills and Butler 1968). Thus, with the exception of the intrusive rocks, these are the youngest rocks in the Uwharrie Volcanic Belt of central North Carolina. Flowbanding is present in nearly all of these rocks, becoming more pronounced upon weathering. The rhyolite that caps Morrow Mountain is a very dense rock and breaks with a conchoidal fracture. The rock is porphyritic and contains orthoclase, quartz, and occasional plagioclase phenocrysts. Many of the phenocrysts contain inclusions of sericite but quartz is relatively free of inclusions. The groundmass is fine-grained and is composed of quartz, orthoclase, feldspar, sericite, and smaller amounts of chlorite and kaolinite. Sericite often occurs parallel to the flow banding. Pyrite, hematite, and rarer amounts of biotite and epidote are also present.

From here one can get a panoramic view of the Uwharries. To the east are the north-northeast trending ridges of the Troy Anticlinorium composed of the Uwharrie Formation. Tillery argillite is exposed from east of the Pee Dee River to just below the top of the mountain. The western flank of the mountain is composed of the Badin Greenstone basaltic tuffs. The valley west of the mountain contains Tillery argillite; and the elongated hills further west are underlain by the acid tuffaceous argillite and the devitrified vitric tuffs of the McManus Formation.

Morrow Mountain and its immediately surrounding mountains served as "arsenals" for Stone Age Man in North Carolina for

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over 10,000 years. Numerous large Stone Age quarry sites are in the area, several on the flanks of Morrow Mountain itself. The top of the mountain is one vast aboriginal quarry and workshop and, its elevation has been measurably lowered over the last 25 years by the illegal removal of artifacts. The flow rhyolite atop this mountain was used primarily for projectile points and piercing tools. It is ill-suited for chopping and other heavy use.

A nearby stream has exposed outcrops, pebbles and boulders of just about every kind of rock associtated in the 30 square miles around Morrow Mountain. In addition to quarrying stone on the mountain, the Indians and their ancestors "worked" these mountain streams as well.

Further, the area has several aboriginal occupation and camp sites. One, the Lowder's Ferry Site has successive occupations dating back earlier than 6000 years. It lies beneath the asphalt parking lot at the boathouse.

Descend the mountain.

50.7 Pass park entrance and return to Valley Road.

52.1 Turn left (south) onto Valley Road (Co. Rd. 1720).

52.6 Cross Mountain Creek. The convoy has just passed into the McManus Formation from the Tillery Formation.

54.1 Turn right (west) onto County Road 1730.

54.6 Omit ~~Stop~~ 8. "Vitric" tuff of the McManus Formation:

(Mudstone Member: Cid Formation of Stromquist and Sundelius 1969).

The convoy is now on the extreme eastern flank of the New London Syncline.

The contact between the Tillery and McManus Formations lies approximately .25 of a mile east of here. Exposed in this roadcut is devitrified vitric tuff that is interbedded with the tuffaceous argillites (Stop 3). These beds of "vitric" tuff are excellent horizon markers because they form thin, long northeast trending ridges and can be traced along strike for as much as 50 miles (Stromquist and Conley 1959). These beds are a few tens of feet thick or less.

In hand specimen, the tuff is a light gray massive rock which when hit with a hammer, emits a distinctive metallic sound and breaks with a conchoidal fracture. The rock is well jointed, giving the outcrop a blocky appearance. Upon

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weathering, the rock develops a characteristic white, smooth cortex.

Some of the "vitric" tuffs here contain swirl flow banding, indicating that the rock may have been a welded flow tuff. The rock is now composed of quartz and albite making up 59 to 95 percent of the rock (Butler and Ragland 1969: 717). Devitrification and metasomatism have now altered the volcanic glass to quartz, producing a highly silicic rock. Butler and Ragland (1969:718) state that the present composition of the "vitric" tuff is a result of metasomatism of sodic rhyolitic glass by indigenous waters of the interbedded tuffaceous argillite after deep burial. A possibility that the metasomatism occurred during regional metamorphism cannot be ruled out.

The rocks here are striking and dipping 30° to the northwest. Occurring below (east) the "vitric" tuffs is a thin bed of lithic tuff, which grades downward into the felsic tuffaceous argillite. On the west end of this exposure are the felsic tuffaceous argillites overlying the "vitric" tuffs. This "vitric" tuff has been found in numerous archaeological sites in the area. It seems to have been preferred by certain cultures for the making of their tools. These cultures include Kirk (8800-8900 BP), Stanly (7000 BP), Guilford (6000 BP) and Duncan (5500 BP).

55.7 Turn left (south) onto County Road 1731.

56.7 Junction with N.C. 24, 27, 73. Turn left (east) onto N.C. 24, 27, 73.

57.6 "Vitric" tuff ridge; this ridge is the same ridge as at Stop 10.

59.1 The convoy is now passing through one of numerous gabbro intrusions in the Albemarle quadrangle.

61.3 Stop 9. Gabbro Sill with Tillery Argillite:

1/20/48
Roll 3 #1

At this stop is exposed a hairline contact between a gabbro sill and laminated argillite of the Tillery Formation. Stony Mountain, located approximately 1.2 miles northwest of here is another of these sill-like bodies in which the intruding magma has bowed up the roof into an elongate dome resembling a small laccolith. These intrusions, which are distributed throughout the Uwharrie Volcanic Belt, are usually sills although all do not conform so perfectly with the bedding of the country rock as shown at this exposure. Some of the intrusions are amygdaloidal indicating that they are now filled with quartz and were first recognized by Bowman (1954). Cutting the gabbro exposed here are several

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Slumped bedding

quartz veins measuring up to 2 inches thick.

The gabbro sills have been observed intruding the Albemarle Group only and not the Tater Top Group. This suggests that the gabbro might be of the same age as the Tater Top Group. The gabbros could represent feeders for the basaltic tuffs of the Badin Greenstone. Conley (1962a: 11) suggests that such a hypothesis is further substantiated by the presence of amygdules in the gabbros, and the presence of occasional basaltic dikes in the vicinity of the gabbros.

Exposed on the eastern end of the roadcut on the northern side of the road, is fragmental varved argillite showing slump bedding. The argillites exhibit well developed graded bedding and contain fragments varying from 1/4 to over 2 inches in diameter. The fragments are predominantly subrounded metasedimentary rocks, but some metavolcanic fragments have been observed. Slump bedding occurs in this exposure indicating that the sediments were deposited at an angle high enough to cause plastic flow and deformation of the deposits before compaction and lithification. Pettijohn (1949: 145) states, "These structures are confined to a single bed or zone between undisturbed beds. In many cases the disturbance is restricted to layers a mere inch or two thick. Such deformation is usually due to subaqueous slump or gliding. This structure seems most characteristic of the thick silt-shale sequences of graded beds which mark delta-like accumulations of geosynclines." Stromquist and Conley (1959: 19) postulated that the varved argillites were deposited on subaqueous slopes of an old volcanic landmass to the east and slumped down these slopes.

Looking east from here across the river, the northeast trending ridges of the Troy Anticlinorium can be seen. During Late Precambrian and Early Paleozoic times, this structure was probably a volcanic landmass that was surrounded by marine water (Worthington and Siff 1970). The source for the argillite exposed here was from the erosion of this volcanic landmass to the east. Each rainstorm that fell on this volcanic island would have carried to sea a new source of material, which upon reaching the basin would be more dense than the surrounding water. This would produce a gentle gravity current which would always move down the subaqueous slope of the island and out into the center of the basin. Upon settling, the debris would produce varved sediments. We will examine this volcanic island more closely in the next several stops.

Cross the Pee Dee River into Montgomery County.

62.8 The convoy is now entering the western flank of the Troy Anticlinorium.

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63.4 61.3 2.1 Roll 3 #2

Stop 10. Uwharrie Formation:

This stop is located on the western flank of the Troy Anticlinorium, once a volcanic island surrounded by marine water. The rocks exposed in this roadcut and quarry belong to the Uwharrie Formartion. This formation contains the oldest rocks thus far recognized in the Uwharrie Volcanic Belt in this area.

This exposure contains fine-grained well-bedded and sorted tuffs. Most of the tuffs in this formation lack bedding and sorting, indicating subaerial deposition. It is thought that the tuffs here were deposited in shallow water along the margins of the old volcanic landmass. These rocks are believed to grade upward into the Tillery argillites.

The eastern end of the exposure and quarry on the south side of the road contains a tuff with lithic and crystal fragments. Associated with the tuff is an isolated rhyolite flow. These flows are distributed throughout the anticlinorium. Many of these rhyolites contain spherulites which Emmons (1856) thought were fossils and named them Paleotrochis.

From this vantage point, one can imagine what this area looked like some 500-600 million years ago. This anticlinorium was a volcanic landmass with much volcanism occurring. First volcanic ash was deposited, some in shallow water (like at this stop), but most of the ash was falling on land. This was followed by lava flows progressing down slopes, picking up previously deposited material. During or shortly after this volcanism, weathering and heavy erosion took place, transporting material down to the surrounding sea, thus forming the laminated, slumped, and fragmented argillite that is exposed at Stop 10.

Turn around and drive west on N.C. 24, 27, 73.

63.7 Turn right (north) onto County Road 1150.

64.4 White Crest Church on left. Southwest of here Conley (1962) reported a brecciated porphyritic flow rock containing angular blocks 4 to 6 feet across.

69.8 Junction with Mt. Carmel Church Road (Co. Rd. 1146). Straight ahead.

70.9 Exposure of the Tillery Formation argillite, now metamorphosed to phyllite.

71.0 **Stop 11. Quarry in the Tillery Formation and Shear Zone:**

quarry for road gravel

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This is a 20 minute stop. At this stop, two abandoned quarries are in the shear zone that parallels the Troy Anticlinorium. At this point the shear zone is approximately one mile wide. The rocks exposed here belong to the Tillery Formation, but have been metamorphosed to phyllites. argillite

kinks! bidding

The presence of the shear zone is best seen in the southernmost quarry. On the northwest wall, a probably low angle thrust fault has been thrusted over the northern side. Strike of the fault is about parallel to the creek (east-northeast). Strike of the phyllite in the floor of the quarry is N. 24° E., dipping 27° toward the northwest.

The thrust fault shows a dip varying between 10° and 38° towards the west-southwest. Greatest dips are towards the base of the quarry. The average dip has been calculated to be between 10° and 15°.

Evidence for this fault is indicated by, 1) a quartz vein which now occupies the fault thrust, 2) secondary mineralization in the form of hornblende now altered to chlorite, 3) small isolated folds along the thrust zone which may have been produced by the thrusting, and 4) shearing and polishing of the chloritized hornblende. Slickensides (scratches caused by faulting) are considered to be strong evidence for the existence of faulting in this quarry.

The northern quarry is mostly uniform in dip. No faults are exposed in these phyllites. On the north wall a kink zone is exposed. This feature was probably created during regional uplift.

This is the locality that Stromquist and Sundelius (1969) reported "coalified" algae from. This algae, which was of Early Paleozoic age, is one of the only three fossils identified within the Uwharrie Volcanic Belt of North Carolina.

Approximately .1 of a mile east of here, the Troy Anticlinorium containing the Uwharrie Formation comes in contact with the Tillery Formation. The shearing has not affected the rocks of the Uwharrie Formation to any great extent.

Turn around and go south on County Road 1150.

72.2 Junction with Mt. Carmel Church Road (Co. Rd. 1146). Turn left (east) onto Mt. Carmel Church Rd.

74.7 Stop 12. Rhyolitic flows of the Uwharrie Formation:

Rhyolite fine & coarse grained

Exposed here are fine-to-medium-grained rhyolites. These rocks are usually porphyritic with orthoclase and quartz

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phenocrysts. Plagioclase is occasionally observed as phenocrysts. Flow lines are difficult to recognize on the surface, however, upon weathering, the flow lines become more easily seen. In some of these rhyolites, flow lines can be recognized only in thin sections. The colour of the fresh rhyolite is gray to grayish-black. Upon weathering, the rock develops some shade of white cortex. In rare cases, the cortex is reddish-brown in colour. Spheroidal weathering is characteristic of these rocks. The groundmass is composed of a mixture of quartz, sericite, and kaolinite. Sericite often occurs parallel to the flowage. Smaller amounts of pyrite, hematite, and epidote occur in nearly all thin sections.

This stop is located immediately west of the axis of the Troy Anticlinorium. The stratigraphic position of the rhyolite on the anticlinorium has been debated for several years. Conley (1962a), who first geologically mapped a portion of this structure placed these rhyolites in the Upper Volcanic Sequence. Burt (1967) working in the northwestern eighth of the Troy quadrangle, mapped the rhyolite as belonging to Conley's Upper Volcanic Sequence, but stated that some of the rhyolites could belong to Conley's Lower Volcanic Sequence (Conley and Bain's Uwharrie Formation). Upchurch (1968), who mapped this portion of the Troy quadrangle, placed the rhyolites in the Lower Volcanic Sequence. Stromquist and Sundelius (1969) also mapped the rhyolites on the Troy Anticlinorium as belonging to the Uwharrie Formation. Northeast of here in the Asheboro quadrangle, Seiders (1974) mapped the rhyolite flows in the Uwharrie Formation. East of here in Moore County, Conley (1962a) included rhyolitic flows within his Lower Volcanic Sequence.

Rhyolite taken from Burt's area as being stratigraphically equivalent to Conley's Lower Volcanic Sequence in the Albemarle quadrangle, obtained a rubidium-strontium date of 535 ± 50 M.Y.A. Rhyolite taken from the Upper Volcanic Sequence (Morrow Mountain Rhyolite unit) produced a rubidium-strontium date of 494 ± 14 M.Y.A. Felsic rocks taken from near the top of the Uwharrie Formation in the Asheboro quadrangle, produced a date of 580 M.Y.A. (Seiders and Wright 1977). When possible error in age determination is considered, once can easily see that these results are inclusive as to where these rhyolites belong in the stratigraphic sequence.

It is clear on Conley's geologic map of the Albemarle quadrangle and Seiders' geologic map of the Asheboro quadrangle, that the hills capped by the rhyolite on the Troy Anticlinorium do follow a regional trend. Does this suggest that no unconformity exists on this structure?

Previously mentioned at Stop 6, the rhyolite unconformably

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overlying the Albemarle Group, forms irregularly-shaped hills and not ridges having a reginal trend. Recent geologic mapping in the Dutchman's Creek area just south of this stop shows no evidence for an angular unconformity (Jones 1977). The rhyolitic flows mostly overlie the tuffs of the Uwharrie Formation, however, some flows were found interbedded with the tuffs. As seen at Stop 6, the base of the rhyolite unit is composed of a lithic tuff. A similar sequence was observed in the area north of Morrow Mountain, just north of Falls Dam (this will be discussed at Stop 14). Here on the anticlinorium, no basal lithic tuff was found. Also spherulitic rhyolite seems to occur only on the anticlinorium, at present, no localities of the spherulitic rhyolite have been reported west of this structure.

Archaeologically, the rhyolite exposed here has been found in numerous sites in the area. This material and even more porphyritic rhyolite north of here are the most widespread raw material used by aboriginal man in this area and within 50 miles of here. coarse crystals

Continue east on Mt. Carmel Church Road.

75.5 Junction with County Road 1147. Turn left (north) onto Co. Rd. 1147.

77.3 Intersection with N.C. 109, turn left onto N.C. 109.

78.3 Exposure of coarse-grained porphyritic rhyolite similar to that at Stop 14.

81.1 Village of Uwharrie. Straight ahead on N.C. 109.

81.8 Omit Stop 13. Folding in the Tillery Argillite:

Coll #3
#3,4,5

At this exposure of the Tillery argillite, good examples of symmetrical folding are illustrated. There is also at least one example of an asymmetrical fold. These folds are 3 to 4 feet high and have wavelengths of 5 to 8 feet. Faulting is observed at several places in the exposure. At the northern end of the roadcut, on the east side of the road, a fault appears to have displaced a block layer within the argillite a distance of 3 to 4 feet vertically. This fault could possibly be classified as a normal fault. Several quartz veins cut the argillite, usually representing a fault zone now fill-in.

This exposure lies within the same northeast trending shear zone as at Stop 12. This shear zone may be responsible for the faulting of these folds. The folding may be related to the Troy Anticlinorium.
We will cross the Uwharrie River below here. This river

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flows in the bottom of this shear zone.

Continue north on N.C. 109.

82.4 Numerous quartz veins cutting the Tillery argillite. The convoy is now on the western edge of the same shear zone that the rhyolites at Stop 13 are in.

82.6 Junction with County Road 1153, turn sharp left onto County Road 1153 to the Uwharrie Wildlife Refuge.

83.0 Early Stop 14. Lunch Stop in the Uwharrie Wildlife Management Area:

Pull into parking lot on right. This is a 45 minute lunch stop. Exposed in the roadcut across the road from the parking area are the Tillery argillites. A dolerite dike cuts the argillites in the roadcut that the convoy passed coming from N.C. 109. This dike strikes north-northeast and is exposed on the road to the south near the stream.

Recent mapping by Catawba's Anthropology-Geology section in the Uwharrie Wildlife Management Area approximately 1.5 miles west of here, has shown that the Morrow Mountain Rhyolite unit can be subdivided into three units: 1) a basal unit of felsic and lithic-felsic tuffs, 2) medium-grained and brecciated rhyolitic flows, and 3) an upper unit consisting of porphyritic rhyolite with rare medium-grained rhyolites (Jones 1977).

Evidence for the angular unconformity between the Tillery Formation and the Tater Top Group was also found in the mapped area. The rocks of the Tater Top Group are nearly horizontal while the underlying Tillery argillites are steeply dipping. The presence of a shear zone was also located during the fieldwork. This data will be available to you in the near future, hopefully.

83.4 Turn left (north) onto N.C. 109.

85.8 Village of Eldorado. Turn right (east) onto County Road 1302. In the woods behind the gas station to the right, is located the Henderson lead and zinc mine. The mine was extensively worked in the early 1900's.

87.2 Coggins' Gold Mine on the right. The underlying rock is argillite of the Tillery Formation. This deposit is part of the mineralization which occurs along the shear zone which can be traced from here southwestward through Eldorado. The mine was operated from the late 1800's through 1934. Some of the gold recovered has been valued at $53 per ton.

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88.8 Enter Randolph County. The convoy is now on County Road 1103.

96.0 Gabbro exposure. This exposure belongs to a gabbro sill intruding the Tillery Formation.

96.5 Junction with N.C. 49. Turn right (north) onto N.C. 49.

103.2 Junction with County Road 1142. Turn left (north) onto Co. Rd. 1142. The convoy has just moved into the Uwharrie Formation from the Tillery Formation.

103.5 Turn right (south) onto County Road 1107.

104.2 The convoy is now over a northwest-trending strike-slip fault mapped by Seiders (1974).

105.1 Stop sign. Turn right (east) onto County Road 1193.

105.6 The convoy has just passed another northwest-trending strike-slip fault. This fault has a displacement of approximately 300 feet.

106.3 Turn left (north) onto County Road 1320. The convoy is back in the Tillery Formation with the contact between this formation and the Uwharrie Formation approximately .2 of a mile east of here.

108.0 Turn left (west) onto County Road 1326.

109.0 <u>Stop 15. Slump Sturctures or Weathering (?) Feature in the Tillery Argillite</u>:

At this stop, the blocky to thinly laminated Tillery argillites are exposed. The blocky argillites crop out on the southern end of the roadcut; the thinly laminated rocks predominate in the northern half. These argillites are similar to those examined elsewhere on this tour. The rocks here are dipping 30° to the northwest, striking N. 25° E.

A unique feature is exposed in the northern half of the roadcut. Concentric laminations in the decomposed thinly laminated argillites can be easily seen. Some of these laminations are oval-shaped, while others are circular in shape. Note how these laminations only occur in certain beds and are overlain by relatively undisturbed laminated argillite. This either means that these oval-shaped laminations are depositional features that did not occur in the overlying beds, or that if this is a weathering phenomenon, the weathering has only affected certain beds for several reasons.

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These features in the argillite have been jointed. Some of these joints have now been filled with a ferromagnesium mineral. Note how these concentric laminations terminate at these joints. In only a few instances do the concentric laminations cross a joint. Some of the joints have shown slight movement, thus classifying them as a fault. Displacements of 2 inches have been observed.

A small fault is exposed in the northernmost erosional slumped cut at the top of the roadcut. This fault has a displacement of 5 inches. A northwest trending dolerite dike crops out on the top of the hill west of this stop.

This stop was chosen primarily to get opinions and ideas on these concentric laminations from the professional geologists and other laymen. What are your ideas?

Continue north on County Road 1327.

109.4 Junction with U.S. 64. Turn left (west) onto U.S. 64.

109.9 Stop 16. Tillery-Uwharrie Formation Contact:

In this exposure the Tillery argillites are interbedded with felsic tuffs of the Uwharrie Formation. The argillites are striking N. 30° E., dipping 31° to the northwest. The argillites are similar to those at Stop 15. The felsic tuffs are medium-to-coarse-grained, consisting of approximately 30-40 percent feldspar fragments. Small, black magnetite crystals are distributed throughout the rock.

The Uwharrie Formation from here east, has been folded into an anticlinal structure. The axis of this structure is located 1.9 miles east of here. Approximately 3 miles southeast of here, the axis terminates at a northeast-trending strike-dip fault.

Seiders and Wright (1977:7) have dated zircons from the felsic rocks near the top of the Uwharrie Formation. Plotting upper and lower concordia intercepts of 580 and 350 M.Y.A. The first date is accepted, falling into the stratigraphic sequence neatly. The lower intercept on the cord may possibly represent a time of regional metamorphism.

Cross Back Creek.

110.7 Crossroads.. Turn right (north) onto County Road 1418.

111.9 Turn left (west) onto County Road 1416. Prepare for a quick right!

112.1 Turn right (north) onto Mount View Church Road (Co. Rd. 1413).

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112.8 Turn right (east) onto gravel road. Proceed to the end of the road.

113.15 Stop 17. Coarse-Grained Gabbro in Abandoned Quarry:

This stop is near the tip of a presumably west-dipping sheet of gabbro containing abundant large hornblende crystals. The hornblende crystals, many 5 cm long, tend to occur in pockets. In outcrop it can be seen that these hornblende pockets radiate downward and thus probably grew from the roof of the magma chamber. The upper part of each layer is relatively rich in sodic plagioclase with abundant green epidote and patches of bluish-gray quartz. Black hornblende increases in abundance more or less gradually downward until it makes up most of the rock. A new layer then begins abruptly (Seiders and Wright 1977: 33).

In his mapping of the Asheboro quadrangle, Seiders (1974) included several quartz porphyry bodies within this gabbro sheet. If the inferred age relationships of the quartz porphyry and gabbric rocks are correct, the quartz porphyry must be a projection of country rock or an included block within the gabbro. The pre-existing quartz porphyry played an important role in the differentiation of the gabbro to quartz gabbro (Seiders 1977: 33).

Turn around and return to Co. Rd. 1413.

113.5 Turn left (south) onto Mount View Church Road (Co. Rd. 1413).

114.2 Stop sign. Turn right (west) onto County Road 1416.

115.8 Junction with U.S. 64. Turn left (east) onto U.S. 64.

116.1 Stop 18. Archaeology of the Caraway-Back Creek Valleys:

During the winter (November-March) of 1976 and 1977, Catawba College conducted an archaeological and geological survey of the Caraway and Back Creek drainage basins. The survey basically extended from Old Highway 49 (now Co. Rd. 1193), northward to Shephards and Caraway Mountains on Caraway Creek, across U.S. 64, and to the Asheboro City lakes #3 and #4 on Back Creek.

A large number of sites (hunting camps, quarry sites, settlements, and village sites) were found in or near the floodplains of both creeks. Artifact evidence showed that man has been in this area for the past 11,500 years. Aboriginal man was living here when the "white man" arrived. A nearby village, Keyauwee, was visited by John Lawson in 1701 (see below).

Settlers began to arrive here in the 1730's and '40's, from

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up the Cape Fear and down the Valley of Virginia from Pennsylvania, and down the Great Trading Path from the Petersburg, Virginia area. Some owned a great many acres of land. One owner had all the land from Highway 64 northward to beyond Shepards Mountain (including Shephards Mountain). Much of the original land is still owned by descendents of the original land owners.

From this vantage point, several geologic features can be seen. To the north, Shepherds and Caraway Mountains are noticeable. These two features are composed of felsic tuffs and flows and possibly are volcanic necks, plugs, or some sub-volcanic intrusion. These felsic rocks were mapped as belonging to the Tillery Formation (Seiders 1974).

Looking west, Ridges Mountain, a prominent north-south trending ridge is seen. This ridge is one of several gabbro sills that has intruded the Tillery Formation. A northeast-trending syncline comes across the northern part of this feature.

At this stop, the argillite of the Tillery Formation crops out. Approximately one-half mile east of here, the same gabbro body as at Stop 18 is exposed. Generally, the underlying rock controls this area's topography. The higher elevations are more resistant rocks such as gabbro, tuffs, or flows. The lower terrain, for example, the flood plain of Caraway Creek, is underlain by the less resistant mudstones and argillites. In some cases, quartz veins and dolerite dikes control the topography forming long, narrow ridges of varying heights.

116.5 Turn right (south) onto County Road 1318, pass Driving Range.

117.4 Stop 19. Baked (?) Tillery Argillite:

Exposed here are the Tillery argillites that apparently have been baked (altered) by the introduction of two gabbroic sills into the immediate area. One gabbro sheet supports the small hill immediately east and north or here. A larger gabbro sill underlies the ridge immediately to the southwest. The gabbro in this larger sill shows an increase in grain size from its outer boundaries inward. The outer boundaries of this sill have apparently cooled quicker, making the rock finer-grained than the interior rock, which is coarser-grained.

The gabbro located in the Asheboro quadrangle is chemically similar in composition with those in the other areas of the Uwharrie Volcanic Belt in central North Carolina (see, Seiders 1977; Pogue 1910; Conley 1962a). The age of these gabbro intrusions in this area is uncertain, but they are

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certainly younger than the stratified rocks (Seiders 1977: 20). Most of the gabbro dikes and sills in the Asheboro quadrangle are in the Tillery Formation. In the Denton quadrangle, Stomquist, Choquette, and Sundelius (1971) place the gabbro in the Late Paleozoic. Stromquist and Sundelius (1975), interpret the gabbro intrusions as being Ordovician (?) in age.

118.3 Bifurcation with County Road 1328, straight ahead.

119.3 Cross Back Creek. The convoy is still in the Tillery Formation, and has just passed the northernmost strike-slip fault earlier mentioned.

119.5 Sheared tuff of the Tillery Formation, a quartz vein, and dolerite dike crop out on the hill to the right.

119.7 Junction with County Road 1314, straight ahead. Exposure of baked (?) argillite on the left.

120.3 Turn right (west) onto County Road 1193. The southernmost strike-slip fault passes through this intersection.

121.1 Hill to the left is underlain by a very thick-bedded, pebbly mudstone and laminated mudstone. Pebbles consist of angular to rounded mudstone and felsic volcanic rocks.

121.3 Cross Caraway Creek.

123.7 Village of Farmer, straight ahead.

125.4 Junction with N.C. 49. Turn right (south) onto N.C. 49.

128.5 Junction with N.C. 47. Turn right onto N.C. 47.

129.9 The convoy is now over the contact of the Tillery Formation and the Mudstone Member of the Cid Formation.

130.2 Junction with County Road 1301, straight ahead. The convoy has just traveled over the Denton Anticline. We are still in the Mudstone Member of the Cid Formation.

133.6 Junction with N.C. 109, turn right (north) onto N.C. 109.

133.8 Turn left (west) onto N.C. 47. Go through the center of Denton.

134.1 Turn left (south) onto Bringle Ferry Road (Co. Rd. 1002).

137.3 Cross Lick Creek. Could this be named for a nearby salt lick?

137.4 Intersection with N.C. 8, straight ahead. Healing Springs

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138.6 The convoy is still in the Mudstone member of the Cid Formation. To the right is Flat Swamp Mountain.

140.7 Pull off onto the dirt road before crossing railroad tracks.

Stop 20. Section through Flat Swamp Mountain:

"This railroad cut when pieced together with several other partial sections in the area, tells the story of how one volcanic disturbance 'lived and died'. It started off by building up a landmass, in part by Pelean cones and by hot avalanche deposits that probably originated from swarms of fissures. These discharges of crystal-lithic tuffs were followed by collapse and slackened outbursts to form a thick bed of fine-grained tuffs, lenses of breccias and volcanic 'mudstone' breccias, after which the disturbance died. Fine-grained acid tuffaceous argillite surrounds the coarser facies of the Flat Swamp Mountain sequence and represent the fine ash that was deposited in the sea about the Flat Swamp Mountain landmass" (Stromquist and Conley 1959: 31).

Exposed here are rocks belonging to the Mudstone and Flat Swamp members of the Cid Formation. Going up the section northward along the railroad we cross a sequence of bedded argillite and siltstone overlain by a complex of acid-intermediate "vitric"-crystal-lapilli tuff, "vitric" tuff, vesicular greenstone, acid to intermediate stratified tuff, and lenses of breccia.

"The coarse crystal-lithic-lapilli tuff represents the first outbursts of hot avalanches which swept down the slopes of the volcanic landmass and deposited this material at its base" (ibid, 32).

"As you traverse the section, note that the coarse tuff grades into an aphanitic rock at two places. These aphanitic rocks resemble flows but thin section studies show them to be 'glassy' tuffs. Note how the coarse tuff gradually 'pinches out' northward forming only occasional lenses of coarse tuff in a largely fine-grained tuff of the same composition, indicating increasing volcanic activity" (ibid, 32).

Approximately 4 miles south of here, Bald Mountain stands above the surrounding countryside. This mountain is underlain in part, by a distictive green rhyolite. This rock is very dense and hard to break. This mountain may have been a volcanic neck or plug.

Continue west on Bringle Ferry Road, crossing over the Yadkin River and into Rowan County.

141.7 The convoy is now passing over a tuff breccia belonging to

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	the Flat Swamp Member of the Cid Formation.
142.7	Exposed in this area are rocks belonging to the Flat Swamp Member of the Cid Formation. They are lithologically similar to the rocks at Stop 21. We are now on the northern flank of the Denton Anticline.
144.1	The Silver Hill Fault strikes north-northeast at this point. The convoy is now entering the Gold Hill-Silver Hill Fault zone, with the Tillery Formation phyllites, schists, and lenses of andesitic-basaltic breccia and gabbro.
146.3	Cross arm of High Rock Lake. The Gold Hill Fault strikes through this roadcut. Similar to that of Stop 1.
148.2	The convoy is now in the Mudstone Member of the Cid Formation.
150.2	Intersection with Province Church Road (Co. Rd. 2134). Turn right (north) onto Co. Rd. 2134.
152.4	Cross arm of High Rock Lake.
153.5	Turn left (west) onto Long Ferry Road (Co. Rd. 2120).
155.6	Trading Ford. Turn left (west) onto Long Ferry Road.
155.8	Turn right (north) onto Dukeville Road. Turn into the school parking lot.

Stop 21. History of Trading Ford:

In North Carolina, the "Carolina Slate Belt" was almost entirely occupied by Siouan-speaking Indians of the Catawba and Tutelo Nations when the Europeans contacted them in the mid-1600's (the Catawba, also in South Carolina, had been visited by Spaniards a century earlier). The Iroquoian Tuscarora and their allies dwelt east of Raleigh, Henderson and Dunn, while Algonkian speakers lived along the coastal areas.

"The Great Trading Path", by which most piedmont Indians were visited, began at Fort Henry (Petersburg), Virginia. It was also called the "Occaneechi Path". It traveled southwest to the Occaneechi at Clarksville; southwest to the Eno just north of Durham; the Eno near Hillsboro, on to the Sissipahaw at Haw Old Fields; entered Randolph County at Julian, traveled southwest and crossed Caraway Creek just north of where the Caraway and Little Caraway join.

Here was Keyauwee Town, home of the Keyauwee Indians, the only Indians in what is now the U.S., except the Northwest

Coast Tlingit, Nootka, and Kwakiutl, to have moustaches and beards. The rock formations on ridges and nearby mountains served as their ceremonial areas.

From Keyauwee, the Great Path branched. One branch swept in a southwesterly arc between Caraway Creek and the Uwharrie River, crossing the latter near Hoover Grove Church to the present N.C. Highway 49, into Davidson County; through Handy and Healing Springs, and through Flat Swamp Mountain Gap on the present N.C. Highway 8; across Abbotts Creek to south of Cotton Grove; west along Jersey Church Road; across Swearing Creek and both Potts Creeks to the Trading Ford, (north bank of High Rock Lake ((Yadkin River)), where westernmost power lines cross); and, onto the Island in the Yadkin opposite the present Duke Power Buck Steam Plant. A large Indian village occupied the Island. This Island is due north up Dukeville Road and on the other side of the Power Plant. Dukeville Road is part of the Trading Path.

The other Trading Path branch crossed the Uwharrie River near where U.S. Highway 64 crosses now; southwest into Davidson County to Silver Valley; southwest to just north of Silver Hill; across Abbotts and Swearing Creeks to Linwood and, south across the two Potts Creeks to the Trading Ford.

From the Island, the Trading Path entered Catawba territory. It went southward, just east of the present Salisbury through Mecklenburg County; through the Catawba homeland near Rock Hill, South Carolina; and, through Columbia to Augusta, at which was the boundary of the Siouan-speaking Catawba. Various major trails or paths branched off at certain points along the way, some going over 1000 miles.

The other trade route of Europeans into piedmont North Carolina was from Charleston via the "trail from Winyah Bay (S.C.) to the Cherawa". John Lawson, and English Surveyor, traveled this route to where it enters North Carolina, and then followed the west side of the Pee Dee and Yadkin to the Trading Ford and Indian Village (this trail is not well-defined historically after it enters North Carolina, but Catawba College research has located much of it).

From there, Lawson traveled the Great Trading Path to the Eno near Durham. Part of his party continued on the Path but he went eastward, making one of the earlies, if not the first east-west trails. From the descriptions of this literate man, we have gained most of what we know about early Piedmont North Carolina, its flora, fauna, geology, and inhabitants. Later he was tortured and murdered by the Tuscarora in revenge for the land theft of others. See Lefler (1967) for his complete travels, though Lefler's trail route is in error.

The hamlet of Trading Ford we passed through is not <u>the</u> Ford, as noted above, but a later settlement taking that name.

It is believed that Edward Bland of Fort Henry was the first European to travel the Trading Path to trade with the Siouan-speakers (and the Cherokee, Iroquoian speakers, beyond) in 1650. Henry and Joseph Hatcher, with Benjamin Bullington, operating as traders out of Fort Henry for

Abraham Wood, are believed to have followed in 1663. They were not very literate, however, and we have no clear records of their travels but, we know that they had maps with the names of local creeks and rivers correctly located, before they ventured down the Path with their laden horses. Dr. John Lederer was in the area in 1670 but, his journal is filled with such errors and exaggerations that it is of little use. Only Lawson provided a useful and lucid record.

The traders were so avaricious and coarse in their behavior that the Indians shortly required they live on a hill nearby--the present site of Salisbury. In time, the Indians refused them the use of the Ford, so they used a route now followed by the north loop of Leonard Road; through the present Trading Ford; northeast to the Yadkin, where the road now forks. They took the north fork and went north across the Yadkin to the peninsula between South and North Potts Creeks and northward. Another route crossed the Yadkin to the same peninsula but turned eastward across North Potts Creek, across the current Linwood-Southmont Road onto the original Trading Path along Jersey Church Road and onto the route to the Occaneechi and to Fort Henry.

Parts of these trails and roads still exist. Only recently, several key portions were destroyed in Davidson County by the construction of the Interstate 85 route around east Lexington and by the Southern Railroads' construction of their new Linwood "Hump" yard. C'est le vie.

The history herin is provided by the History section of the Museum of Anthropology.

The Museum's Cartography section thought you'd be interested in a little information concerning the difficulty of early traders and cartographers in locating the Uwharrie Mountains.

Ogilby's 1672 map had a desert extending from Moore and Montgomery Counties south of Salisbury to Statesville, with a large lake about where Lake Norman is now. There were mountains around Keyauwee Town and southeast of Salisbury. Moseley's 1733 and Baldwin's 1755 maps had no mountains at all.

Collets' 1770 map had large mountains south of Salisbury, with the Morrow Mountian group located about right. An unsigned map of 1770 had very prominent Caraway Mountains as well as mountains south, southeast and southwest of Salisbury. Mauzon's 1775 map had a solid range of large mountains from the Yadkin River near Flat Swamp Mountain around to the south of Salisbury, south of Statesville, and on to the Appalachians (little wonder the British had trouble finding their way in 1776).

Suprisingly, Price and Strothers important map of 1808 had most of the Uwharries in central Stanly and Cabarrus Counties (between Salisbury and Concord), with a continuous ridge running to the Appalachians. Apparently he copied Mauzon's 1775 topography.

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