CONTENTS

DLR
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GILES COUNTY REPORT

by
A. A. L. Mathews

PREFACE — ?

INTRODUCTION

A. Location and extent.

I. General physiographic region.

II. Political region.

III. Industrial region.

B. Purpose of the report.

To I. Complete survey of mineral resources.

II. Geology of the region.

III. Man's home.

C. Work already accomplished in the area.

I. Geologists visit to the area. — Prob OK Dr Jones on mineral

II. Reports and articles.

III. Maps.

1. Dublin sheet.

2. Folios of the geologic Atlas of the United States.

3. New topographic maps in preparation. — modify = Rose maps To be in the Report

D. Acknowledgements.

HISTORY

A. A short history of the settlement of the county.

B. A brief summary of the development and improvements in the county.

Classification – see Flumes
Appl – H – =
(Piedmont
(Blue R
Appl. V – & R – set
Gt V –
V – Ridges
Plat
Appl

PHYSIOGRAPHY

A. Physiographic provinces.

I. Appalachian (highlands.) (Valley Ridges →

1. General discussion.

2. Folded and faulted mountain ranges. — Is this physiog. (?) Butler (?) Topog chaos

3. Valley provinces. = ? — not a province

II. Appalachian plateau.

1. Location and limitation.

B. (Rivers and Streams.) Drainage

? I. Location and extent.

II. Drainage basins.
1. Map.
2. Character.
} or combine II & III ?

III. Major rivers.

1. New River.

a. Type.

b. Character.

c. History. — Under Geol. Hist. ?

d. Use.

(1) Drainage.

(2) Transportation.

(3) Power.

— Under Econ Geol Impact waters

2. James River.

a. General discussion.

b. Drainage area.

? c. Uses for timberland. — Econ. Geol. ?

Something about
{ Soils & Timber } if you want

IV. Secondary streams.

? 1. Type.
2. Character.
3. History.
4. Use.

} Omit?

——— TO Econ. Geol.

5. Discussion and description of each;

Omit?

a. Big Walker Creek.
b. Sinking Creek.
c. Big Stony Creek.
d. Little Stony Creek.
e. Wolf Creek.
f. Clendennin Creek.
g. Rich Creek.
h. Johns Creek.

Combine; concise
Omit minor details

? V. Stream anomalies.

1. Meanders.
2. Staggering (?). Prob.

} Is either of an anomaly? Why not describe more streams?

VI. Drainage changes.

1. Maps.
2. Discussion.

} Better? under Physiog. Hist.

Omit VII. Islands.

1. Location.
2. Character.
3. Causes.
4. Use.

} Too refined detail
Rept must not be too voluminous, if ever pub; Strata + Stone will require some space

VIII. Valleys.

1. General discussion.

a. Pearisburg.
b. Walkers Creek, including.

General comment
Discuss types of major valley & combine others in brief

(1) White Gate.

(2) Sugar Run.

(3) Whitley Branch.

(4) Rye Valley.

(5) Broad Hollow.

c. Sinking Creek Valley, including,

(1) Spruce Run.

(2) Clover Hollow.

d. Little Stony Creek, including,

(1) Doe Creek.

e. Big Stony Creek.

f. Wolf Creek.

g. Rich Creek.

h. East River Valley.

i. Johns Valley.

j. Potts Valley.

k. Kimberling Creek Valley, including,

(1) Nobusiness Creek.

(2) Dismal Creek.

IX. Terraces.

1. Rock.

a. Location and distribution.

In Table?

b. Comparative elevations in Appalachian highlands. (Valley Ridges?)

c. Comparative elevations in Appalachian plateau.

Appl. Plat. also & of the Appl Highlands

d. Explanation. — origin?

2. Gravel. — Alluvial?

a. Location and distribution.

b. Comparative elevations, preferably a table of data. ✓

c. Composition of the material. — Better under Study = Recent deposits

Geo 5

d. Correlation.

e. Explanation and history. — Unite Geol. Hist

3. Johns Valley terraces. — Why separate?

a. Explanation and history.

b. Correlation with New River valley terraces.

Discussed previously?

C. Mountains.

I. Type and character.

a. Erosional.

II. Trend and general distribution.

III. General discussion and character of each;

Would be too much detail for this Report — Combine

a. East River Mt.

b. Peters Mt.

c. Wolf Creek Mt.

d. Flat Top Mt.

e. Pearis Mt.

f. Angels Rest.

g. Sugar Run Mt.

h. Brushy Mt.

i. Walker Mt.

j. Gap Mt.

k. Buckeye Mt.

l. Spruce Run Mt.

m. Guinea Mt.

n. Sinking Creek Mt.

o. Johns Creek Mt.

p. Salt Pond Mt.

q. Doe Mt.

r. Butt Mt.

s. Fork Mt.

t. Laurel Mt.

D. Peneplanes.

I. Upland peneplanes. ?

1. Location and extent.

2. Evidence (and proof.)

a. High crest levels of mountain ranges.

b. Table showing comparative elevations of crests and variation of crests from place to place. (This can be obtained mainly by traverse and use of Aneroid.)

c. Crest detritus.

(1) Different types.

(2) Sources or possible sources.

(3) Association and correlation.

d. Other evidences of ancient topographic features.

(1) Ancient stream beds.

(2) Ancient lake beds.

(3) Drained ancient depressions.

(4) Ancient soils.

(5) Fossils.

3. Modification of upland peneplanes.

a. Location and extent of domes.

b. Proof of structural deformation.

c. Correlation of domes.

d. Time of structural doming.

4. Possible early drainage.

a. Map.

b. General discussion.

5. Age of the upland peneplanes. ?

a. Proof for age.

II. Valley peneplanes.

1. Number, type and distribution.

2. Proof of valley peneplanes.

a. Terraces.

b. Secondary ridges. — Shoulders?

c. Correlation of different terrace gravels.

d. Association of ancient stream beds.

3. Age of different valley peneplanes.

a. Proof. of Evidence?

E. Minor physiographic features.

I. Sinks.

1. Area and extent. — Distr. & size

2. Conditions under which they were formed.

3. Drainage.

II. Chimney ridges.

1. Area and extent. — ? Character ?

III. Torrential mud flows.

1. Conditions under which formed.

2. Distributio n.

Butler? under Geol. Hist. Recent events

IV. Gaps.

1. Water gaps.

a. The Narrows.

b. The Gap.

c. Walkers Gap.

d. Rocky Gap.

2. Wind gaps.

a. Cause and distribution. — see abstract in BGSA next issue (March 1932) on wind gaps in Va.

V. Lakes.

1. Mountain lake.

VI. Falls and Rapids.
  1. Falls of the New River.
    a. How formed.
    b. Distribution.
  2. The Cascades.
    a. How formed.
    b. Beauty.

— Better under Rivers?

VII. Caves and caverns. — Diff?
  1. Location and distribution.
  2. Types. — Characteristics?
  3. How formed.

VIII. Springs. — under Econ. Geol. = Gd water
  1. Fresh water.
  2. Sulphur water.
    a. Origin.
  3. Salt water.

F. Summary of the physiographic history of the region. Under Geol. Hist.

Stratigraphy
~~GEOLOGIC HISTORY~~

A. Introduction.
  I. Paleogeographic provinces.
  II. Problems of sedimentation.
  III. Stratigraphic correlations.
  IV. General relations.
  V. Correlation chart.
  ? VI. Sources and acknowledgements.) Should be in the general Introd; may be supplemented here by footnotes.

B. Stratigraphy.

I. Geologic map.

II. General statements regarding the geology.

III. Paleozoic rocks.

1. Cambrian.

a. General discussion.

b. Limitations in this report.

c. Rome formation.

(1) General discussion and use of the name.

(2) Distribution throughout the county.

(3) Characteristics.

(4) Type of sedimentation.

(5) Possible sources of the sediments.

(6) Conditions under which sedimentation took place.

(7) Fossils ~~faunas~~.

d. Honaker limestone.

(1) General discussion and use of the name.

(2) Distribution throughout the county.

(3) Characteristics.

(4) Variation in characteristics.

(5) Type of sedimentation.

(6) Paleogeographic factors.

(7) Fossil faunas.

e. Nolichucky shale.

(1) General discussion, distribution and use of name.

(2) Distribution throughout the county.

(3) Characteristics.

(4) Persistency of characters.

(5) Conditions under which sedimentation took place.

(6) Fossil fauna.

2. Ozarkian system. (Ulrich)

a. General discussion.

b. Copper Ridge dolomite.

(1) General discussion and use of name.

(2) Distribution throughout the county.

(3) Characteristics.

(a) Dolomites predominates.

(b) Sandstones.

Sandstone members.
Sandstone seams and lentals in dolomite.

(c) Chert.

Primary.

Secondary.

(d) Oölitic members.

(4) Persistency in its variability.

(5) Possible sources of sediments.

(6) Paleogeographic factors.

(a) Old land area.

(b) Mud flats.

(c) Sub-areal and sub-aqueous characters.

(d) Orogeny.
Evidence.
Discussion.
} Here or under Geol Hist?

(7) Fossils ~~fauna (?) and flora.~~

c. Summary (and conclusions.)

Can use only 6 "ranks" of headings in text / 5 would be better

3. Canadian system. (Ulrich)

a. General discussion.

(1) Unconformity with Ozarkian.

(2) Regional distribution.

(3) Regional correlation.

(4) Reason for making the division. — not clear

b. Stonehenge limestone (?).

(1) General discussion. Relations

c. Nittany dolomite.

(1) General discussion and use of name.

(2) Distribution throughout the county.

(3) Characteristics.

(a) Forms one of the competent members. Unit Structure

(b) Pure dolomite.

(c) Chert.
Breaks to reasonably large fragments.
Lenses.
Bedded.
Appears as snow or frost in the fields.

(d) Soluble.
Caves and caverns.
Sink holes.
Rounded surface topography.
Cliffs along rivers.

(e) Color, variable.
Some bluish gray.
Most a light cream or gray.

(4) Persistency of characters.

(5) Conditions under which sedimentation too place.

(6) Fossils.

d. Post-Nittany dolomite.

(1) General discussion.

(2) There is a mass of dolomite above the Nittany which has not been worked out as yet. No real good location has been found to make the determinations and limitations.

c. Orogeny. — Not here

4. Ordovician system (restricted) Subdivisions = formations

a. General discussion and problems.

(1) Previous work.

(2) Divisions into various stratigraphic units.

(3) General characteristics.

(4) Regional correlation.

(5) Limitation in this report.

? b. The Chickamauga problem. — Is there any now?

Discuss briefly under a

(1) General discussion.

(2) Variability in use of the term.

(a) Inclusions.

(3) Delineation.

c. Unconformity at base of Ordovician.

(1) Evidence.

(a) Chert breccia forming basal conglomerate.
Character.
Extent.
Associated red sandstone, and shale.

Valid evidence?

(b) Change in type of sedimentation.
From dolomite.
To limestone.

(c) Slight difference in strike and dip of beds.

(d) Biostatic difference.

(2) Distribution.

(a) Throughout the county and adjacent areas.

d. Murfreesboro limestone.

(1) General discussion and correlation.

(2) Distribution throughout the county.

(3) Characteristics.

(a) Impure limestones and pure limestones.

(b) Thick and thin bedded limestones.

(c) Chert.
Bedded white chert which breaks into small rectangular fragments, forms snow and frost in the fields.
Bedded bluish gray chert along bedding planes, which may be secondary.
Nodular, bluish gray to black chert.

(d) Soulble limestone.
This formation forms more caves, and sink holes than any other.
Rounded hills.

(e) Wavy black lines through the limestones.

(4) Persistency in the characters.

(5) Type of sedimentation.

(6) Conditions under which sedimentation too place.

(7) Forms karst topography. Good photo?

(8) Fossil fauna.

e. Moshcim limestone.

(1) Apparent conformity with the Murfeesboro limestone

(2) General discussion and correlation.

(3) Distribution in the county.

~~Give thickness at different localities.~~

(4) Characteristics. Define

(a) Purity of the limestone or vaughanite.

(b) Color.

(c) Fracture.

(d) Uniformity in texture.

(5) Persistency in the characteristics.

(6) Type of sedimentation.

(7) Conditions under which sedimentation took place.

(8) Variability in thickness.

(9) Fossil fauna.

f. Lenoir limestone.

(1) Unconformity at the base.

(2) General discussion, regional correlation and use of the name.

(3) Distribution, variation in thickness and occurrence throughout the county.

(4) Characteristics.

(a) Pure and impure limestones.

(b) In general thin bedded limestones.

(c) Clay seams and partings on bedding.

(d) Black chert. Usually nodular, probably secondary.

(e) Soluble limestone.

(f) Crystallinity.
Some beds very coarse.
Other beds dense cryptocrystalline.

(5) Variability in character throughout the area.

(6) Coral reef along Sinking Creek.

(7) Conditions under which sedimentation took place.

(8) Topography.

(9) Fossil fauna. Some localities the fossils are silicified.

g. Moccasin limestone and marble.

(1) Possible unconformity at the base.

(2) General discussion and regional correlation.

(3) Lowville age.

(4) Divisible units in Giles County.

(a) Pembroke marble member apparently local.

(b) Red Moccasin member more general.

(5) Pembroke marble member.

(a) Distribution in the county.

(b) Characteristics.
Thin and thick bedded.
Compact.
Hard.
Resistant.
Very fine grained.
Variable colored.
Breaks with conchoidal fracture.
Takes beautiful polish.

(c) Colors.
Red
Red and green mottled.
Copper red.
Black mottled with red.
Gray.
Gray and red breccia.
Red moire.
All streaked with white calcite.

(d) Persistency in characteristics and thickness.

(e) Conditions under which sedimentation took place.
Mud cracks.
Rippled marked.
(Pumbra only?)

(f) Topography.
Forms ledges.

(g) Fossil fauna.

(6) Red Moccasin limestone member.

(a) General discussion and correlation.

(b) Distribution throughout the county.

(c) Characteristics.
Incompetent member.
Strong cleavage development.
Red clay limestone, forming almost a soapstone.

(d) Persistency in characteristics.

(e) Conditions under which sedimentation took place.

(f) Secondary alteration. Forms marble in some beds.

(g) Fossil fauna.

h. Eggleston limestone.

(1) Unconformity at the base.

(2) General discussion and correlation, including the proposed new name.

(3) Age, Upper Black River.

(4) Distribution.

(a) Throughout the county.

(b) Throughout the region.

(5) Characteristics.

(a) Impure limestone.

(b) Decidedly yellowish gray.

(c) Reasonably thin bedded.

(d) Some thin members of yellowish shale.

(e) Jointing always perpendicular to bedding plane, forming uniform fragments or blocks.

(f) Slightly weathered blocks are somewhat punky.

(6) Persistency of characteristics throughout area.

(7) Conditions under which sedimentation took place.

(8) Fossil fauna.

Not separate fm?

i. Bentonite.

(1) Occurrence.

(2) Position.

Basal member of the Trenton, intercalated with very thin bedded Trenton limestone.

(3) Description.

? J. Oms?

j. Martinsburg limestones and shales.

(1) General discussion.

(2) Regional correlation.

(3) Use of the name.

(4) Divisions into stratigraphic units.

k. Trenton limestone.

(1) Apparent conformity with Eggleston limestone.

(2) General discussion and correlation.

(3) Distribution throughout the county.

(4) Characteristics.

(a) Thin bedded blue gray limestones.

(b) Very thin calcareous shale partings in lower and middle part. More shaly in upper part.

(c) Most limestone members highly fossiliferous.

(d) Irregular bedding planes.

(e) Member reasonably resistant.

(5) Divided into smaller units only on paleontologic evidence.

(6) Persistency of characters throughout the area.

(7) Type of sedimentation.

(8) Conditions under which sedimentation took place.

(9) Fossil faunas.

l. Eden shale.

(1) Gradation from Trenton limestone.

(2) General discussion and correlation.

(3) Distribution throughout the county.

(4) Characteristics.

(a) Very thin bedded gray limestone interbedded with thicker, fine grained, calcareous shales.

(b) The whole weathers to a fine talus which is a rusty brown in color.

(c) Some limestone members fossiliferous.

(d) Very non resistent, forming one of the incompetent members of the region.

(e) Forms excellent wheat soil.

(5) No good basis for division into smaller units.

(6) Formation very difficult to trace throughout the area, due to its characteristic of eroding easily. It seldom shows as an outcrop.

(7) Conditions under which sedimentation took place.

(8) Fossils.

m. Fairview formation.

(1) General discussion and general correlation.

(a) Stratigraphic correlation.
Lithologic.
Zones, principally the Orthorhynchula linneyi zone.

(b) Divisiblity into lower dominantly limestone member and an upper sandstone member.

(2) Conformable contact with Eden shale. And gradational from the shale.

(3) Distribution throughout the county.

(4) Characteristics.

(a) Thin bedded light gray limestones separatedby thin fissile shaly partings, at the base. This series grades upwards by having sandstone beds intercalated which become more persistant and dominant towards the Othorhynchula linneyi zone, which is at the top of the bottom member.

(b) Bryozoa reefs occurs at two horizons in bottom member.

(c) Upper member above Orthorhynchula linneyi gray sandstone, very dense and very fine grained carrying a pelecypod fauna. Byssonychia radiata common.

(5) Types of sedimentation.

(6) Conditions under which sedimentation took place.

(7) Fossil faunas.

(8) Analysis of characteristics and faunas with a discussion of the different members.

n. Close of the Ordovician.

(1) General discussion and problem.

(2) Paleogeography.

5. Silurian. System

a. General discussion and problem.

(1) Previous work.

(2) Comparison with other regions.

(3) Regional correlation.

(4) General characteristics.

(5) Stratigraphic units.

(6) Limitations in this report.

b. Unconformity at the base of the Silurian.

(1) Evidence.

(a) Slight angularity of beds.

(b) Changes in type of sedimentation.

From marine to non-marine.

(2) Distribution.

(a) Throughout the county.

(b) In adjacent regions.

c. Physiographic relief in area due to Silurian rocks.

d. Juniata formation.

(1) General discussion and correlation.

(2) Unconformable contacts.

(3) Distribution throughout the county.

(4) Characteristics.

(a) Thin and thick bedded, fine grained, dense, red sandstones.

(b) Color dark red mottled with light green.

(c) Irregular bedding surfaces.

(d) Breaks into blocks.

(e) Resistant sandstones and reasonably non-resistant shales.

(f) Shale members very dark red.

(g) Some sandstone members cross-bedded.

(h) Some well defined unconformities in the formation.

(5) Variation in characters from place to place.

(6) Type of sedimentat ion.

(7) Conditions under which sedimentation tookplace.

(8) Secondary alteration.

(a) Discussion relating to color.

(b) Metamorphism of some sandstone members.

(9) Fossil discussion.

c. Clinch sandstone.

(1) General discussion and correlation.

(2) Formation itself is composed partly of a basal conglomerate which is an unconformity in itself.

(3) Distribution.

(a) Throughout the region.

(b) Throughout the county.

(4) Characteristics.

(a) Coarse sandstone.

(b) Basal conglomerate.

(c) Resistance, mountain bearing formation.

(d) Relative competency of formation.

(5) Persistency of characteristics.

(a) Throughout the county.

(b) Throughout the region.

Discuss separately with Relations?

with Structure?

(6) Type of sedimentation.

(7) Conditions under which sedimentation too place.

(8) Fossils.

f. Clinton formation. — Series or group?

(1) General discussion including the retaining of the name for stratigraphic purposes.

(2) Regional correlation.

(3) Division of the formation into smaller units.

(4) Cacapon shale and red sandstone (member.) fm?

(a) General discussion.

(b) Distribution throughout the county.

(c) Characteristics.

Red shales.

Red sandstone.

Clay balls.

Dominant irregular surface of beds.

Ironstone.

(d) Type of sedimentation.

(e) Conditions under which sedimonattion took place.

(f) Upper shale member.

Iron ore association.

(g) Fossil faunas.

Red shales and sandstones.

Upper shales.

(h) Variability in the member.
Physical.
Thickness.
Faunas.

Do you have plates of slabs showing sed features?

(5) Keefer sandstone member. ?

(a) General discussion.

(b) Apparent conformity at base.

(c) Distribution throughout the county.

(d) Characteristics.

Medium to coarse grained sandstones.

Thick beds.

Saccharoidal sandstone.

Resistant.

Some quartzite.

Weathers to a sandy, frosty, glistening talus.

(e) Type of sedimentation.

(f) Conditions under which sedimentation took place.

(g) Persistency of characteristics throughout the county.

(h) Fossils (?).

g. Close of the Silurian. — hiatus?

(1) Great unconformity at close of Keefer.

(a) Great angular unconformity as shown at The Narrows.

(b) Hiatus with Cayuga limestone absent.

(2) Paleogeography. — to Geol. Hist? (Brief here = OK)

6. Devonian system

a) General discussion and problems.

(1) Previous work. — ?

(2) Comparison with other regions.

(3) Regional correlation.

(4) General characteristics.

(5) General discussion of stratigraphic units.

(6) Limitation in this report.

(7) Mineralization.

(8) Best outcrops for study in Montgomery, Pulaska and Bland counties.

(9) Forms incompetent stratigraphic units. = Structure

b. Becroft sandstone.

(1) General discussion.

The Oriskany problem.

Variation in characteristics from other regions.

(2) Distribution throughout the county.

(a) Limitation due to faulting.

(b) Occurance in closed and open folds.

(3) Characteristics.

(a) Coarse grained impure sandstones.

(b) Very porous sandstone.

(c) Thick bedded sandstone.

(d) Impregnated and replaced by manganese.

(4) Type of sedimentation.

(5) Conditions under which sedimentation took place.

(6) Fossil fauna.

c. Onondaga formation.

(1) General discussion.

(2) Distribution throughout the county.

(3) Characteristics.

(a) Shales.

(b) Limestones.

(c) Cherts.

(d) Manganese stained limestones and cherts.

(e) Hard, brittle and resistant chert limestones.

(f) Non-resistant shales.

(4) Type of sedimentation.

(5) Conditions under which sedimentation took place.

(6) Fossil fauna.

d. Romney shale.

(1) General discussion.

(2) Distribution throughout the county.

(3) Characteristics.

(a) Black, fissile, knotty shales.

(b) Cause of black color.

Mn vs. carbon. — Any analysis { For Mn? / " % C?

(c) Non-resistant.

(4) Occurrence.

(a) Limitation due to faulting.

(b) Primarily in closed folds.

(5) Type of sedimentation.

(6) Conditions under which sedimentation took place.

(7) Fossils.

e. Brallier shale.

(1) General discussion and correlation.

The Kimberling shale. } Note why no longer
The Jennings formation. } in "good standing"

The Portage. — ?

Age.

(2) Distribution throughout the county.

(3) Characteristic section for this region.

(a) Bland County.

(4) Characteristics.

(a) Fine-grained, fissile, siliceous shales.

(b) A great thick series.

(c) Thin beds of fine grained sandstones intercalated.

(d) Color, light reddish-brown, weathering to a rusty brown.

(e) Non-resistant.

(5) Incompetency.

= Structure

This formation forms the most incompetent series throughout the entire area, and consistently is the formation which forms the tread for the overthrust faults.

(6) Type of sedimentation.

(7) Conditions under which sedimentation took place.

(8) Fossils.

f. Chemung formation.

(1) General discussion and correlation.

(2) Distribution throughout the county.

(3) Characteristic section for this region.

(a) Near Lindside, West Virginia.

(4) Characteristics.

(a) Fine-grained shales.

(b) Sandstone beds more resistant and thicker than in Brallier shale.

(c) Color red, and reddish-brown.

(5) Incompetency.

= Structure

(a) Similar to Brallier shale.

(6) Conditions under which sedimentation took place.

(7) Fossil fauna.

g. Close of the Devonian.

(1) General discussion and problem.

(2) Paleogeography.) = Geol. Hist. (Brief here)

7. Carboniferous problem. = ?

a. General discussion.

b. Delineation.

8. Mississippian.

a. General discussion.

(1) Previous work.

(2) Regional correlation.

(3) General characteristics.

(4) Regional distribution.

(5) Stratigraphic units involved.

b. Unconformity at the base of the system.

(1) Apparent conformity at the top of the Devonian.

(2) Hiatus. Catskill absent.

(3) Basal conglomerate at base of system. } Note - Lapse = no longer valid term

(4) Biostatic unconformity.

c. New Providence formation.

(1) General discussion and selection of the name.

(a) Compare with Pocono.

Berea sandstone and Sunbury shale not recognized. (No fossils?)

Member carries marine fauna.

(b) Correlation.

(2) Distribution throughout the county.

(3) Characteristics.

(a) Thin and thick bedded, fine and coarse resistant sandstones.

(b) Some members very resistant forming hills.

(c) Marine sediments. Some shale.

(d) Basal member a conglomerate in some places. Pebbles, well assorted quarts and well rounded and polished about the size of beans.

(e) One member well up from the base is a bone coal. Corresponds in position with the Merrimac seam.

(4) Competency. Forms secondary ridges. = Structure

(5) Conditions under which sedimentation took place.

(6) Fossil fauna.

d. Maccrady shale.

(1) General discussion and correlation.

(2) Distribution throughout the county. — Details = bearing in sw Va.

(3) Characteristics and type of sedimentation.

? e. The Greenbrier problem. = ?

(1) Hiatus at the base.

(a) Warsaw and Salem absent.

(2) General discussion.

f. St. Louis limestone.

(1) General discussion. Basis for correlation.

(2) Distribution throughout the county.

(3) Characteristics.

(a) Dominantly a limestone with some thinner shaly and sandy members intercalated.

(b) Typically a light gray with some chert nodules at two horizons.

(c) Reasonably resistant. Upper part aids Ste. Genevieve in forming ridges.

(d) Usually weathers to a rusty gray.

(4) Conditions under which sedimentation took place.

(5) Fossil faunas.

g. Ste. Genevieve limestone.

(1) General discussion.

(2) Distribution throughout the county.

(3) Characteristics.

(a) Drak gray, thin and thick bedded, resistant, coarsely crystalline, somewhat oölitic limestone.

(b) Some beds are cherty.
Black, tough, irony chert.

(4) Resistance. This limestone forms tertiary ridges throughout the area.

(5) Conditions under which sedimenattion took place.

(6) Fossil fauna.

h. Gasper limestone.

(1) Conformable or unconformable contact with Ste. Genevieve is a question.

(a) The thin sandstone member at the base may correspond with the Bethel sandstone further west.

(b) Difference in lithology.

(c) Supposed hiatus.

(2) General discussion and correlation.

(3) Distribution throughout the county.

(4) Characteristics.

(a) Lit., bluish gray, dominantly thin bedded limestone with three more resistant dense members. One resistant member breaks into elongated rhombohedrons like cord wood.

(b) On the whole the limestone is very fine grained or very fine crystalline rock. One bed dominantly oölitic.

(c) Weathers to a rather fine calcareous talus light brownish gray or buff in color.

(d) A very few highly calcareous sandstone members.

(5) Persistency of the characteristics.

(6) Conditions under which sedimentation took place.

(7) Fossil faunas.

i. Bluefield shale.

(1) General discussion and correlation.

(2) Distribution throughout the county.

(3) Contacts.

(a) At its base uncertain. In this county it appears gradational into the Gasper limestone, thus drawing the boundry at the base of the highly calcareous shales.

(b) At its top the contact is definite, since the shale is capped by the Stony Gap sandstone member of the Pennington form.

(4) Characteristics.

(a) Dominantly a calcareous shale and calcareous sandstone series.

(b) Shale members non resistant.

(c) Sandstone members very resistant, forming ridges.

(d) Some limestones intercalated with the shales.

(e) Color dominantly a bluish gray, greenish gray with two red members near the top.

(f) Weathers into fine shoe peg fragments.

(5) Conditions under which sedimentation took place.

(6) Fossil faunas.

j. Pennington formation.

(1) General discussion and correlation.

(a) Discussion concerning the use of the name.

(b) Correlation throughout the region.

(2) Distribution throughout the county.

(3) Characteristics.

(a) Emphasis should be placed on the variability of the formation since it includes hard and soft sandstones, slaty and friable shales and some resistant limestones Variability in color, but are dominantly red and dark gray and some black.

(b) Characterized by unconformaties withing the formation, and other irregular characters.

(c) Bone coal occurs in thin seams.

(4) Persistency of the variable characters.

(5) Type of sedimentation.

(a) Fossil land plants.

(b) A number of coal seams.

(c) Lack of abundance of characteristic marine fossils.

(d) Some marine fossils.

(6) Conditions under which sedimentation took place.

(7) Fossils.

k. Princeton conglomerate.

(1) General discussion and correlation.

(2) Regional distribution.

(3) Occurance and distribution in the county.

(4) Characteristics.

(5) Type of sedimentation.

(6) Conditions under which sedimentation took place.

IV. Tertiary sediments.

1. Terrace sands and gravels.
   a. Distribution and correlation.
   b. Fossils.
2. Conglomerate.
   a. Occurrence and distribution.
   b. Fossils.
3. Type of sediments.

V. Stratigraphic sections.

The plan, if agreeable is to group all of the detailed sections together under one heading in one section of the report. Giving first the general columnar section, preferably a drawing thus forming a plate, and second the detailed descriptions of the sections. The detailed sections should be given in the order of the columnar section, i.e., the younger members first and the oldest at the last.

Detailed sections of the following formations have been measured and are ready for the report:

Pennington formation.
Bluefield shale.
Gasper limestone.
Ste. Genevieve limestone.
St. Louis limestone.
New Providence formation.
Chemung *
Brallier *
Romney shale*
Onondaga formation.
Becroft *
Clinton formation.
    Keefer sandstone member.
    Cacapon shale and red sandstone member.
Clinch sandstone.
Juniata formation.
Fairview formation.
Eden shale.
Trenton limestone.
Eggleston limestone.
Moccasin limestone*
    Pembroke marble member.
Lenoir limestone *
Mosheim limestone.
Murfreesboro limestone *

Post Nittany dolomite (?) *
Nittany dolomite *
Stonehenge limestone (?)*
Copper Ridge dolomite.
Nolichucky shale.
Honaker limestone.
Rome formation *

Note: * means work not satisfactory or complete.

Structural Geol ?

C. (Hist Geol - History / Historical Geology.) Should be a sequential discussion of all significant events in Virginia = from Rome to Recent — intelligible to layman

I. General discussion of the paleogeography of the region, during,

1. The Paleozoic era.

2. Tertiary and Recent times.

II. Shift in depositional areas during Paleozoic time.

III. Development of organisms. Brief, but adequate.

1. Plants.

2. Animals.

IV. Brief review of the development of the mountain ranges in reference to periodicity of mountain Buiilding, and subsequent degredation forming low topographic relief of ancient date.

V. Subsequent rejuvination and sculpture. — Epirises ?

VI. Any other factors involved in a general history.

A "high point" = orogenic belt of the old Appl. Mts.

? D. Economic Geol —

Rec 12/18-1932 ack

REPORT OF PROGRESS IN THE STUDY OF THE STRATIGRAPHY OF GILES COUNTY, VIRGINIA

Submitted to the National Research Council

by A. A. L. Mathews
12/13/32

The work accomplished during the year under the Grant-In-Aid by the National Research Council embodies a detailed study of the thirty four different formations and members present in Giles County, Virginia, besides the study of several formations which outcrop in adjacent areas. Fossil faunas have been collected from twenty three formations and groups. The formations have been traced laterally throughout the region and many photographs taken to illustrate the characteristic features of many. One new formation is described. The field work of measuring sections and collecting fossil faunas has been completed. Although this work is probably adequate for a preliminary report on the Stratigraphy, it is advisable to delay the manuscript, until the fossil faunas can be studied in a suitable institution and library reference have been studied. Therefore, this report of progress must not be construed for publication.

The following is a very brief resume of the salient features pertaining to the Stratigraphy of Giles County. It might be considered as an abstract of the final report. A correlation chart has been prepared, which is not submitted with this report, since it is somewhat premature to the one which Dr. Charles Butts will publish in his forthcoming Bulletin. And, since he has spent the past few years in the general stratigraphic study of the region, his work should precede this report of progress. Besides, I am deeply indebted to him for his generous direction in the study of the stratigraphy of this area.

Stratigraphy

Due to the structure and physiography of the Giles County area, a great array of bedrocks are exposed for study. The stratigraphy is intimately associated with the structure and physiography and a brief outline of these features is necessary to explain adequately the field relations of the different formations.

Technically, the structure of Giles County consists of three shingle blocks with the long axes extending from northeast to southwest of the full length of the county. These blocks are separated by two major thrust faults. The three blocks are bounded by four major thrust faults, namely, beginning with the southeastern, Pulaski, Bland, Narrows and St. Clair faults. The last three traverse the county. Each of the shingle blocks pitch to the southeast. The central Shingle block is crossed transversely by three folds, the largest being the Pearisburg anticlinorium. Due to these major and minor structures an irregular shaped dome occupies the center of the area, with radiating anticlines and synclines extending beyond the central area. Naturally, the different formations are arranged around this central and radiating feature, as well as along the edges of the different shingle blocks. New river has cut across all of these blocks at nearly right angles and its tributaries has carved the edges, so that the different formations are well exposed for study. Some of the formations, due to the variation of competency are ridge makers and others are valley makers.

The most consistant ridge maker in the entire area is the Clinch sandstone. This formation either caps or holds up all of the higher mountains, except the extreme northern tip of the county, where the Princeton conglomerate forms the cap rock. The most incompetent members

are the Eden and Romney shales, however the deeper valleys are nearly always associated with either the Murfreesboro limestone, the Copper Ridge dolomite and the Honaker limestone. The Murfreesboro limestone is extremely soluble forming the very characteristic sink-hole topography of the region. The Nittany dolomite is always closely associated with the up-thrown block along the thrust faults, however the Copper Ridge dolomite and the Honaker limestone frequently occupies that position. Due to its competency, the Nittany dolomite usually forms the secondar ridges. The tertiary ridges are formed by the resistance to weathering of the lower marble member of the Moccasin limestone, which usually caps the outlying spurs along the main mountain ranges. Because of the difference in competency of the formations and the structure of the area, the drainage has become adjusted to a lattice pattern.

Paleogeographic conditions during the periods of sedimentation were not the same in at least the northern and souther part of the county, consequently a different type and arrangement of formations occurs in the two basins. The dividing line between the two basins follow closely the trace of the Bland Fault, which is south of the central part of the area. The present close proximity of two widely different sedimentary basins, is due at the present time to the foreshortening of the earths crust in this area. Hereafter these basins will be referred to as the northern and southern basins.

The bedrock formations of Giles County consists of Paleozoic rocks of different ages involving the Cambrian (restricted), Ozarkian, Canadian, Ordovician (restricted), Silurian, Devonian and Mississippian systems. Because of the great number of time breaks indicated by the absence of a number of formations, this county forms a critical area for study between the Northern and Southern Appalachian embayments.

The stratigraphic relations of the different formations show clearly in the accompanying table.

TABLE 1. - Bedrock formations of Giles County, Virginia

	Outcrops	Equivalents
Paleozoic rocks		
Mississippian system		
Chesterian		
	----------(Bluestone)	Kinkaid and Degonia
	Princeton conglomerate	Degonia and Clore
		(Palestine sandstone
		(Menard limestone
	Pennington formation ---------(	(Wallersburg sandstone
		(Viena limestone
		(Tar Springs sandstone
		(Glen Dean limestone
	Bluefield shale ----------(	(Hardingsburg sandstone
		(Golconda formation
	----------(Cypress sandstone)	
		(Paint Creek formation
	Gasper limestone ----------(	(Yankeetown chert
		(Renault formation
	Bethel sandstone	Aux Vases sandstone
	Ste. Genevieve limestone -----(	(O'hara limestone
		(Fredonia oölite
Meramecian		
	St. Louis limestone	
	----------(Salem limestone)	
	----------(Warsaw limestone)	
Osagian		
	----------(Keokuk limestone)	
	Macrady shale) --------(Burlington limestone	
	New Providence formation)	
	----------(Kinderhookian)	
	----------(Chattanoogan)	
Devonian system		
Chemung		
	Chemung formation	
Senecan		
	Brallier shale	Portage formation
		(Naples part of Portage
	Romney (extended) all	(Genesee sandstone
Erian		(Tully limestone
	Romney shale (restricted)---------	(Hamilton shale
		(Marcellus shale
Ulsterian		
	Onondaga chert	Onondaga formation
	----------(Schoharie sandstone)	
	----------(Oriskanian)	
Helderbergian		
	Becraft sandstone	Becraft limestone

----------(New Scotland limestone)
----------(Coeymans limestone)
----------(Keyser ?)

Silurian system
----------(Cayugan)
Niagaran
----------(Lockport)
----------(Racine ?)
Clinton group
----------(Rochester shale)
Clinton formation
Kaefer sandstone member
Cacapon shale and red sandstone member
Medinan
Alexandrian
Clinch sandstone
Richmond
Juniata formation — Elkhorn & Whitewater
----------(Liberty)
----------(Maysville)

Ordovician system (restricted)
Cincinnatian
Maysville
----------(McMillan limestone)
Fairview limestone
Eden
Eden shale (undivided)
Mohawkian
Trenton group
Trenton limestone — (Cathays ?
(Cannon limestone
(Bigby limestone?
(Hermitage limestone
(Curdsville limestone?
Black River
Upper
Eggleston limestone (new) — Chambersburg
Lowville
Moccasin limestone
Upper red Moccasin member — Leray limestone
Lower marble member
Chazyan
----------(Blount)
Stones River
----------(Lebanon limestone)
Lenoir limestone — Ridley limestone
Hoshein limestone — Pierce shale ?
Murfreesboro limestone — Murfreesboro limestone
----------(Buffalo River series)

Canadian system
Beekmantown
Bellefonte dolomite
Nittany dolomite
----------(?)(Stonehenge limestone)
Ozarkian system
----------(Chepultepec dolomite)
Copper Ridge dolomite
----------(Bibb dolomite)
----------(Ketona dolomite)
----------(Brierfield dolomite)
Cambrian system (restricted)
Middle and Upper
Holichucky shale
Honaker limestone ----------((Maryville (Rogersville (Rutledge
Lower and Middle
Rome formation
Lower
Shady dolomite (?)
----------(Chilhowie)

Cambrian System (restricted)

The oldest bedrock of the area are found east of Bane and flanking the Bland and Narrows faults in the southern and northern parts of the county. These are all sedimentary and are a part of the Cambrian system.

Although there are some soils along the Bland Fault which indicates the presence of the Shady dolomite, an outcrop has not been recognized.

The Rome ("Watauga") formation is well represented in the central dome just east of Bane. The formation consists primarily of thin beds of brittle limestone and very thin bedded, finely laminated, light red, and reddish brown shales making up the greater part of the mass. When first exposed in excavations, some of the shale members are a very light green . No fossils were found., but specimens collected in an adjacent area and undoubtedly coming from the same formation, contained Zacanthoides near Z. typicalis and Hyolithes sp. Some elements of the Rome formation have the lithologic

characteristics of the Ophir shale in the Great Basin area, and in these the underterminable life impressions are very similar.

The Honaker limestone which overlies the Rome formation apparently conformably is a thick series of thin bedded, blue gray, rather pure limestone with shaly partings in certain zones. The lower members are an alternation between the red shales of the Rome and the yellow shales of the Honaker, consequently the contact is indistinct. The upper 7/8 th of the formation is a decided limestone, with occasional arenaceous lentils. The limestones are very similar to the Rutledge and Marysville limestones in Tennessee, but no distinct shaly member has been observed corresponding to the Rogersville shale of that area. This formation is considered Middle and Upper Cambrian, because of its position between the Rome formation and the Nolichucky shale. No fossils have been found in the limestone.

Perhaps the most distinctive stratigraphic key formation of the lower Paleozoic is the Nolichucky shale. It is found every place where the Cambrian is exposed and is not only persistent, but easy to recognize. The Nolichucky consists of light gray, finely grained, arenaceous, thin bedded platy shale which parts with an even smooth surface. Some beds are more calcareous forming a light blue limestone with uneven surface and are more resistant than the rest of the formation. These limestone beds can be traced frequently through the pasture and wood lands, and serve as a good marker for the formation. The weathered surface of these beds usually carries a number of black brachiopod shells which are distinctive of the formation. The Nolichucky shale is very fossiliferous containing both a flora and a fauna. The flora consists of primitive ramose and branching patterns which are taken to represent plants, possibly an algae. The fauna consists primarily of

calcareo-phospatic brachioped shells which are always a jet black. These are of the Obolacea type. There are a few trilobites. A pentamerous shaped plate of an undescribed cystoid is always present in the formation. Fossils. Dicellomus appalachia, Lingulella buttsi and Asaphiscus (Blainia) cf. gregaria.

Ozarkian System

Only one formation has been recognized as belonging to the Ozarkian System in Giles County, namely, the Copper Ridge dolomite. Its basal contact with the Nolichucky shale is distinct, forming a disconformity with the Brierfield, Ketona and Bibb dolomites absent. This formation consists of thick and thin bedded dolomites with a great many sandy dolomite members and sandstone beds and lentils through the entire mass. A pure white, friable, quartz sandstone of uniform grains overlies the Nolichucky shale and forms the basal member of the formation. The beds of dolomite containing sand laminae or lentils show a uniform face when first exposed, but on weathered surface the fine laminations are well defined. As many as nineteen laminae have been counted in one foot of strata. Many beds contain white, blue gray, blue and black chert lentils and nodular masses. The chert is always tough, breaks with difficulty and forms sharp edges. The sedimentary conditions under which the Copper Ridge dolomite was deposited in this area was satisfactory for the forming of oölites of the zonal type. Oölites are indicative of the formation in this area. Much of the chert is secondary, since dolomitic oölites and oölitic chert are found in contact in the same bed. The life of the time is represented maily by Cryptozoa, which occurs rather freely throughout certain members of the formation. Just above Chapel is a Cryptozoa reef which is intimately associated with oölites, the grains being scattered between, over and below the Cryptozoa. One straight Orthocone was observed. The upper member of the formation forms valleys,

and this section has not been found in a suitable exposure for study. Fossils. Cryptozoa proliferum, Cryptozoa sp. The Copper Ridge dolomite can be traced laterally through the Newcastle section where it occupies the same horizon as the Conococheague formation which is a magnesian limestone. The Chepultepec dolomite has not been recognized.

Canadian Sayten

The Canadian Sayten is dominantly represented by the Nittany dolomite, however there is some question about the Stonehenge limestone presence at the base in the southern embayment. In the Walker Mountain section a cephalopod of the Quebecoceras type was found. The Nittany dolomite is a thick series of thick, irregular bedded, dense, light gray dolomite which always weathers to a white or light cream color. The beds are separated by thin calcareous shaly partings which vary in thickness from a fraction of an inch to 2 inches. Some beds are as much as fifteen feet thick without an observable seam. From a distance the Nittany dolomite appear to be regularly bedded, but on close examination the surface of most of the beds are undulatory forming small and large undulations with several inches in amplitude. Some bedding planes separate which may be considered an unconformable contact. In The Narrows section a thick chert breccia containing some rounded chert boulders is found well down in the section towards the base. Near the base is a white bed of chert. In some localities chert is common in the formation. It occurs in thin beds, lentils, and nudular masses. It is usually white or light gray, but may be black. The Nittany chert always breaks with a splintery fracture like glas and forms sharp needles and edges. Some beds in the formation contain a high magnesium content, while others are low. It is rare that any sandy lentils or arenaceous beds are found in the formation, a character which aids in recognising it from the Copper Ridge

dolomite, which always contain sandstone beds and sandy lentils.
The Nittany dolomite is a resistant competent member and is usually associated with the upthrown block of the faults. Thus, it might be considered the "thrust-formation". The dolomite weathers into a yellow, sticky soil, which makes good farm lands, when cleared of the chert residue.
The characteristic fossil is the genus Lecanospira, which is found almost everywhere the formation weathers leaving a chert covering. This genus is the most distinctive and most easily recognized guide fossil of any formation.
Fossils. Lecanospira several species

The Bellefonte dolomite is poorly represented in the area, occurring only in the northern basin. It is a thin bedded, platy, light gray or pearl-gray, dense, fine grained, brittle dolomite which breaks with a snap when struck with the hammer. The beds are from two to four inches thick and weather to a characteristic light pearl gray or cream. There is no chert in the formation. The total thickness in the section at The Narrows is thirty two feet.

Ordovician System (restricted)

A great unconformity separates the Bellefonte dolomite from the Murfreesboro limestone the lowest member of the Ordovician System in this area. Here only the lower part of the Chazy series is present, and all belong to the Stones River group.

The Murfreesboro limestone is divisible into several lithologic units, which for convenience are listed here from bottom to top as follows: the basal chert breccia which is seventy feet thick in one area; the thin bedded limestone of uniform grain containing light gray, blue and white chert beds and lentils and regular shaped nodules; the thick bedded, resistant, cliff-forming member; the thinly laminated, nodular looking, thin bedded which

is very cherty, and the upper thin and thick bedded, irregularly patterned and blotchy member. In general the Murfreesboro limestone is a dark bluish gray somewhat dull or dove colored gray with black streaks running through it in three directions. It is very soluble being the cave forming formation of the area and where exposed over wide regions it forms a dominant sink-hole topography. The limestone weathers into a very deep red soil, with whit chert masses scattered over the surface. This is the formation which forms the underground rock between Pearisburg and Ripplemead. The basal breccia is traceable throughout the entire region where the base of the Murfreesboro is exposed. It consists of thick and moderately thick beds of dolomite and limestones filled with numerous fragments of pre-Ordovician chert which are usually angular. In areas where the basal member is thickest, there is usually from 20 to 40 feet of fine grained crystalline limestone which has been considered a marble by some. This is followed by a repetition of the chert breccia beds. The chert of the Murfreesboro limestone is distinctly different from those in the earlier formations. It is easily broken, always forms rectangular faces with columnar cleavage, and breaks into small fragments. That in the upper members is nodular, usually dark gray or black in color, but always break into rectangular pieces. Fossils are plentiful. The most characteristic brachiopods belong to the Orthacea and Strophomenacea. Trilobites, ostreeds, corals and bryozoa are present. The fossils have become silicified and weather out with the chert. Fossils, Leperditia fabulites, Hebertella bellarugosa, Orthis tricenaria (?), Pterygometopus n. sp. Rafinesquina sp. and several forms not determined. The upper part of the formation grades into the overlying Mosheim limestone without an apparent break.

The Mosheim limestone is probablyone of the best key beds in the entire northern basin. It is not present in any quantities in the southern basin. The Mosheim is composed of the purest grade calcium carbonate limestone in the region and is being quarried for lime rock. It is uniformily a vitreous, deep dove gray with white calcite eyes, dense, massive, thick bedded, resistant limestone which weathers to a light dove gray color. Solution surfaces are always smooth and rounded. It breaks with a conchoidal fracture and its composition is uniform throughout the entire mass. It varies in thickness from fifty seven feet at The Narrows to eighteen inches in the southern basin, but no place has a conglomerate been observed at its base like that described in the Roanoke area. However, in that area the Murfreesboro limestone is absent and the Mosheim rests directly upon Nittany dolomite. The formation is not fossiliferous. Fossils. Tetradium syringoporoides, Lophospira sp. and Maclurea sp.

The Lenoir limestone overlies the Mosheim with a slight unconformity. At Kimbalton the two formations are very closely associated, but elsewhere the contact is very distinct. The Lenoir is usually a very dark gray to almost black limestone, containing wavy, nodular, and thin lentels of black or dark blue chert. It is thin bedded, crystalline, and very variable in thickness. In some localities the bottom forty feet is free from chert. At such localities the limestone furnishes good stone for burning. The Lenoir limestone is decidedly variable in thickness, ranging from two hundred feet to only sixty seven feet. The fossil fauna is limited and restricted to mainly trilobites and ostracods. Unless due care is taken in the field, collectors are liable to mistake the upper Murfreesboro limestone for the Lenoir. Fossils. Collection not determined.

A great hiatus separates the Chazy from the Black River series, since neither the Lebanon limestone nor the Blount group are present. However

it is difficult to distinguish the contact between the two formations in a fresh cut. On weathered surface it can be distinguished from the lower Moccasin marble member by its chert content. This marble never contains chert.

The Moccasin limestone (Lowville) is divisible into two units, the lower marble member and the upper red Moccasin member. The lower marble member consists of very fine grained, dense, finely crystalline, varaible colored, resistant, thin and thick bedded, high grade marble, which breaks with a conchoidal fracture and has a vitreous luster. The stone is tough and hard, cuts easily and takes a superior polish. The colors range from a deep red to a golden dove gray. Only a few fossils have been found and these are characteristic Lowville forms.

The red Moccasin member overlies the lower member conformably. It consists of the only dominantly red limestone in the area. It is thick and thin bedded, fibrous, somewhat massive limestone with considerable very fine sand grains scattered through many of the beds. This formation always shows fracture cleavage. Because of this character along with the color, it forms a good key formation. The red Moccasin grades up into the overlying formation without apparent break. In the Narrows section one bed of bentonite occurs just below the top of the formation.

The Eggleston limestone (new) is introduced here because of lack of sufficient data to make proper correlation with the upper Black River formations elsewhere, besides it is a formation filled with many intercalated beds of bentonite of varying thicknesses up to twenty two inches. Thirty four bentonite beds and lentils have been counted in the formation. The formation is a distinctive yellowish brown or buff limestone which posses cuneiform jointing with the joint planes perpendicular to the bedding. The few fossils show that it is a member of the Black River series and is here tentatively correlated a part of the Chambersburg. The formation grades

apparently into the Trenton group conformably, but on close examination of the fossils in the basal member of the Trenton group, the Curdsville limestone is absent.

The Trenton is made up of a great array of thin bedded, blue, crystalline limestone with numerous shaly partings between the beds. The bedding plane surfaces are usually rough and not suitable for flagging. The lowermost member which is here considered the Hermitage limestone is highly fossiliferous and contains the characterist fauna of that formation elsewhere. A detailed examination of the fossil faunas will be necessary before the limitations of the other formations can be determined, consequently no effort should be made to differentiate them until the palaeontological study has been completed.

As far as can be determined, the upper members of the Trenton group grade into the Eden shale without an apparent break. The Eden shales are a brownish gray, which weather to a light brown or buff. They are very thin bedded, finely laminated, highly calcareous, and weather readily to a fine splintery talus slope, which readily turns into fine clay and forms a sticky, plastic mud when wet. The fossils are scarce, consequently the Eden group can not be divided satisfactorily. The Eden shale becomes more and more calcareous at the top and grade up into the overlying Fairview limestone without an apparent break.

The base of the Fairview limestone is arbitrarily placed at the bottom of a thick resistant bryozoa bed. Above this point the sedimentary series become more and more calcareous, containing less and less argilaceous materials. The Fairview limestone may be described as consisting of shaly limestones at the base, grading through thin bedded limestones into arenaceous limestones and thick bedded slightly calcareous sandstones at the top. The limestone beds are a blue gray and the sandstone a greenish gray.

The uppermost members are decidedly thick bedded. This uppermost section forms the Orthorhynchula linneyi zone which contains a very excellent fauna. Fossils. Orthorhynchula linneyi, Dalmanella multisecta, Zygospira modesta, Platystrophia ponderosa, Hebertella sinuata, Hyasonychia radiata, Modiolopsis modiolaris, Ptarinea demissa, Ischyrodonta unionoides, and Orthodesma nasutum. The McMillan limestone member of the Maysville is not present, consequently a hiatus exists between the Fairview and the Juniata sandstone.

Silurian System

The Silurian System is poorly represented in the area. It is composed of the Juniata sandstone, Clinch sandstone and Clinton formation. This group of formations comprises the most resistant rocks of the region and form the higher mountain ranges.

The Juniata formation which in some localities is composed entirely of sandstone, is a variable formation both in composition and thickness. In the Northern basin it is a very fine grained, thich and thin bedded, rather uniformly bedded, blocky, resistant, dark oxblood red sandstone with many beds containing blotches of a very light green. At some horizons in the formation the beds are uniformly cross-bedded and in one horizon an old erosional channel was cut in the sandstone and subsequently filled. In the southern embayment, the Juniata formation is typically a fine grained sandstone and interbedded with many arenaceous shales, the color remains the same. No fossils were found in the formation. The Juniata grades up at the top into lighter colored sandstone and is separated from the overlying Clinch by a basal conglomerate.

The Clinch sandstone is without question the most resistant formation in southwestern Virginia. It is a coarse uniformly grained sandstone near the base with the basal member a well assorted fine grained conglomerate.

It is composed of thick and thin beds of very dense, hard, strongly indurated members, which are light gray to white in color. The upper part becomes thinner bedded. It is the great falls making formation of the region. The Clinch is much thinner in the southern embayment than in the northern. It is correlated with Bassfield of Ohio, probably representing the shore phase of the seas of that time.

The Clinton formation is divisible into two dominantly different members, the lower or the Cacapon shale and red sandstone member and the upper or Keefer sandstone. Wherever the Clinch occurs the Cacapon overlies it. The Cacapon is composed of a thick series of shales and thin beds of sandstones, all of which is a dark iron red. The surface of the shales have very dark red to black slick looking films and the bedding is always undulatory. The color in both shales and sandstone is due to the iron content. The red of the Cacapon is distinctly different from the red of the Juniata formation or the Moccasin limestone, and once the student becomes familiar with the lithology of these different formations they are easily recognized. Fossil seaweeds are common throughout the Cacapon, and a few brachiopods and trilobites, also ostracods can be found in the shaly members. The uppermost seventeen feet is a shale, this member is fossiliferous. Fossils. Anoplotheca hemispherica is the most common. The Cacapon is separated from the Keefer sandstone by a sharp contact at the top of the shale. According to Dr. R. J. Holden, the Clinton iron ore deposits occur at this contact.

The Keefer sandstone is a very dense, resistant, uniform grained sandstone which is nearly a quartzite. It is thick and thin bedded rather pure grade and a yellowish gray color. Although this sandstone is very resistant it is very porous, and weathers into a mushy looking talus. No fossils were found in the member.

Devonian System

Early Devonian formations show that the region was subjected to oscilatory movements during the time of deposition of the sediments, especially up to Hamilton time. The distribution of the Devonian formations throughout the county is patchy, since they usually occupy the axial troughs of the high mountain areas, or the closed folds along the Bland, Narrows and St. Clair faults.

The lower Devonian beds were at one time grouped under the head called "Giles formation" named from the section in Giles County. The section previously described as the location of the"Giles formation" after the known Silurian, is west of Narrows along the north side of Wolf Creek valley. Careful work in this section reveals that the so-called "Giles" sequence is the truncated edges of the overturned recumbent fold along the Narrows fault consisting of the Clinch sandstone, and the repetition of the Cacapon and Keefer members of the Clinton. The final mapping of this area will bring out this relationship. This eliminates all of the Lower Devonian except the Becraft sandstone.

The Becraft sandstone is here considered the equivalent of the upper part of the Becraft limestone farther north east. It is a uniform coarse grained, very porous, gray sandstone which weathers to a decided rusty and reddish brown. Inareas where manganese has replaced it, the formation becomes a ridge maker. The fossils collected in the formation show it to be undoubtedly of Becraft age and not Oriskany as some observers and writers have contended.

The Onondaga formation in this area has been changed to a chert. It consists of thinly bedded white chert and smooth thinly bedded dull light gray to drab shale. The chert weathers to very fine fragments which are somewhat rectangular forming sharp edges. The fossils are characteristic Onondaga forms.

The Romney shale is perhaps the most uniformily wides spread Devonian formation in the area. The best exposure is in the bed of New River just east of Dry Branch in Pulaski County, here its entire section can be studied, but the waters must be low in order to do it. In the mountainsous areas the upper part of the Romney is usually eroded away, so the few exposures indicate only a part of the formation. In regions of the closed folds the shale has become so distorted that it is impossible to tell much about the formation, except that it is composed of very black, friable carbonaceous and manganiferous shale, which weathers to a dirty gray and some places into a pure white plastic clay. Thus the Romney is characterized by its black color, ficility, and glassy surface. Some limestone beds occur near the base of the formation whih consist of a very black fine grained product. The shales weather into a small splintery fragments, do not form a deep soil and is poor land for agriculture. The shales are quite fossiliferous, but due to the condition of the formation on exposed surface, it is difficult to observe the shells. Fossils. Lingula delia, L. muda, Orbiculoidea lodensis, and Buchiola halli are the most common.

The Brallier shale is probably the thikest formation in the entire area. It is not well represented in Giles County, but is well exposed in Bland County to the southwest. The Brallier is composed of a great sequence of alternating shales and sandstones of varying thicknesses, but usually the beds are less than two feet. They are light rusty brown, friable, easily weathered and non resistant. These shales are regarded as upper Portage in age. Fossils are scarce.

The Chemung formation occurs as the basal member of the overturned fold adjacent to the St. Clair fault. The basal part is decidedly shaly, but grades rapidly up into a reddish brown sandstone at the top, which is hard to distinguish from the overlying New Providence formation. The shaly part is fine grained, closely laminated, friable, easily distorted, and weathers

to a fine papery mass. They are a light rusty brown. The fossils collected are characteristic of the Chemung. Fossils. Spirifer disjunctus, Amboccelia umbonata, and several others which have not been determined.

Mississippian System

Rocks of the Mississippian system outcrop only in the northern part of the county. They are separated from the underlying Devonian by a great hiatus represented by the absence of the Chattanoogan and Kinderhookian. Much fossil material has been collected from the different members of the Mississippian, but this material has not been studied in detail, consequently only the brief deductions from the study will be listed here.

The New Providence formation is composed of conglomerates, sandstone, some limestones and shales, but the sandstones predominate. The formation is of marine origin and contain a marine fauna. The lower member of the formatinn is very thick, coarse grained, porous, resistant conglomerate composed of well assorted and well rounded quartz pebbles. The gradation from the basal member is through medium grained thin bedded sandstones to calcareous sandstone, arenaceous limestones, shales, and thin sandstone. The limestone members contain a very good fauna. Near the upper part, but just below a white sandstone member is a five foot bed containing bone coal. This is taken to be the equivalent in age of the Merremac seam of coal in Montgomery and Pulaski counties. The white sandstone has been considered the equivalent in age of the Berea sandstone in Ohio. This is obviously incorrect since the typical Berea is Chattanoogan while the New Providence is equivalent to the Burlington and a part of the Osagian. The upper portion of the formation becomes more shaly, and is overlain by the Maccraday shale. The New Providence formation is one of the ridge makers in regions where it outcrops.

The Maccraday shale is a very friable, thin bedded, thinly laminated red shale which weathers readily forming depressions and rarely outrops.

Only the upper part of the St. Louis limestone is present, consequently a hiatus exists between it and the preceeding formation, with the Keokuk, Warsaw and Salem absent. The St. Louis is a thin bedded, light gray, slightly resistent, somewhat cherty limestone, with some beds rather coarsely crystalline, a darker gray and fossiliferous. There are a number of shaly beds between the limestone beds, and many shaly partings. The basal member is filled with Lithostrotion sp. and Syringopora sp., but higher up in the formation the characteristic crinoidal fauna is present. The formation grades up into the overlying Ste. Genevieve limestone conformably.

The basal members of the Ste. Genevieve limestone is somewhat oölitic. This formation is thick bedded, dark gray, coarsely crystalline, massive, resistant limestone, which contains some chert in irregular nodular forms. Some beds are more resistant than others thus protrude on weathered slopes. Many of the limestone beds are twenty or more feet in thickness, and where free from chert this stone is quarried for industrial uses. The principal diagnostic fossil of the formation is Platycrinus huntsvillae. Although the cups of this species are exceedingly rare, the stem disks are of such a character that due to their abundance, the species is diagnostic.

There is a thin sandstone member between the Ste. Genevieve and the Gasper limestones. It has all of the lithologic characteristics of the Bethel sandstone, however it is only twenty two inches thick. Since it occupies the correct position and possesses the lithologic characters, it is here included as the Bethel sandstone.

The Gasper formation which overlies the Ste. Genevieve limestone apparently conformably, although there is present a diconformity in the near absence of the Bethel sandstone. The formation may readily be divided into two lithologic units, a lower limestone member and an upper shale member. The limestone member is composed of thick and thin bedded light gray limestones with fine medium to coarse crystals. Many beds are argillaceous, and one bed

is oölitic. These limestones are a light muddy gray, break with a strained and rough fracture. The stone iddicates that very fine clay is disseminated throughout the mass. Many of the limestone beds are separated by thin shaly partings and beds, which are highly calcareous. The shale member weathers readily into a very fine talus. It is virtually a highly calcareous thinly bedded non resistant shale, with the color about the same as the limestone. On the whole, the Gasper formation weathers to a yellowish clay soil and forms good farm lands. The formation is very fossiliferous, the fossils weathering out free. The most diagnostic fossil of the formation is Talarocrinus sp. Fossils. Talarocrinus sp., Pentremites godoni, P. welleri, P. myriformis (?), Agassizocrinus, Orthotetes keokeokiensis, Composita trinucleus and Zaphrentis spinulosum.

One of the best outcrops in the county showing the stratigraphic sequence of these formations is on the west side of New River just south of Lurich. Here the St. Louis, Ste. Genevieve, Bethel and Gasper formations are a part of the overturned fold with the St. Louis forming the uppermost member. Each of the limestone members contain more resistant limestone beds which due to differential weathering show clearly the attitude of the strata and the relationship of the formations. Looking across the river from the east the St. Louis is at the left and the Gasper at the right. The beds in this section are concordant. The best collecting ground from these formations is at Bluefield, West Virginia.

The Bluefield shale is a thick formation representing the time periods of the Golconda, Hardingsburg and Glen Dean. It is really a limestone which is highly argillaceous, which weathers readily into a shaly talus. It is light bluish gray to dark gray, with some beds of brownish gray limestone. It weathers into very fine shoe-peg fragments. Some of the more resistant limestone beds stand out on the weathered surface distinctly. The fossils

are plentiful, but not entirely diagnostic. One resistant lomestone member near the base is crowded with many species of fossils. Fossils. Pentremites obesus, Pentremites sp., Composita subquadrata, Diaphragmus elegans, Zaphrentis spinulosa, Archimedes swallovanus and A. invaginatus.

The Pennington (Hinton) formation consists of a very thick series of highly colored shales and sandstones, which grade laterally into varying beds of varying thicknesses from place to place. The shales are strongly colored with bright reds, deep yellows and strong led gray predominating. The sandstones range in color from a light gray or white to a deep red. Many thin black coal smut seams are scattered throughout the formation. The shales are very thin bedded with fine laminations, very friable, fissile, and easily weathered. Some shale members are as much as fifty feet thick with apparently uniform texture. A thick hard resistant sandstone forms the base. It is a ridge maker in areas where exposed. Several hundred feet above the base is a thick sandstone member which is composed of reasonably thin beds that are highly cross-bedded. This is a pure sandstone composed of very fine uniform grained well assorted quartz grains. This is a key bed to the formation. The Pennington formation is partly continental and partly marine. Plant impressions of Sigillaria and Lepidodendron are common , yet marine fish teeth occur in some of the calcareous beds.

The Pennington is overlain by the Princeton conglomerate, which caps the higher mountains of the northern tip of the County. It is a very coarse grained sandstone or a medium to fine grained conglomerate. The pebbles are well assorted, well rounded, and the strata are cross bedded. It is very porous and resistant, light gray to white in color and forms when weathered irregular rough surfaces.

A BRIEF GEOLOGIC HISTORY

OF

GILES COUNTY, VIRGINIA

by

A. A. L. Mathews

Virginia Polytechnic Institute

Mirror Falls

"Touched by a light that hath no name,
A glory never sung,
Aloft on sky and mountain wall,
Are God's great pictures hung."

1936

INTRODUCTION

To the individual who assumes that no special reason exists for concern over anything that moves so slowly that it does not make itself felt in a measureable way in special interests of a single generation, this brief educational discussion will have little appeal. He is liable to think that anything outside of grinding flour and taking toll is inconsequential. Many do not realize that society or civilization is the result of a continuing process and not limited by generations or controlled by the mill grinder. History teaches us that a society which anticipates progress has in times past repeatedly outlived the one which was content with the psychology of satisfaction. Can human life exist without expectation? Is this not the factor which is so clearly indispensable in making it possible for us to fit into our surroundings and lead us to prepare for the society which makes up our great nation? Then, whatever concerns the basis for this belief is vital to our training.

All people with sufficient accumulation of results from logical nature-thinking have formulated views concerning the meaning of their own creation. We are now facing a great question, "whence came we"? The advance in the explanation of nature by modern sciences, has enabled us to interpret the extraordinary story of the past history of our earth, its features and its inhabitants. So we must free our minds of prejudices in order that we may walk together along the highways

and by-ways of this most alluring and intriguing region, and be able to observe, study and discuss some of the process which have made it possible for us to be here to enjoy New River and its environs as typified in Giles County, Virginia.

You and I have had little to do with the mountains, the valleys, and the society in which we find ourselves. There is a whole line of physical, chemical, mechanical and earth processes back of what we observe today. There is also a multitude of human factors behind our own existance over which we have had no control. As a matter of fact we have played a very little part in our existance and our environment. But, what we make out of our lives will depend very much upon our attitude towards our surroundings and associates. Then, why should we not early in life train ourselves to study and understand those things which are nearest to us, and learn to appreciate the value of time and change,

"To sit on rocks --- to muse o'er flood and fell
To slowly trace the forest's shady scene,
Where things that own not man's dominion dwell,
And mortal foot hath ne'er or rarely been;
To climb the trackless mountain all unseen,
With the wild flock that never needs a fold;
Alone o'er steeps and foaming falls to learn;
This is not solitude --- 'tis but to hold
Converse with Nature's charms, and view her stores unrolled."

- Byron

As students in our public schools, we have a right to expect an interpretation of our physical surroundings and to be taught something of its history. Briefly, what we see is not the result of man's planning or his work. It is the result of Creation, a creation by the many active forces of nature. They are water, air, wind, frost, heat

and cold, plants, animals and lastly man. All of these forces have acted upon the region to make it what it is today.

New River with its tributaries has been the great active agent which through much of geologic time has labored relentlessly upon the bed rocks of the region and has through its patience and industry carved and sculptured out the valleys, leaving the mountain ranges as a memento of another land. Thus, Giles County and its people are held in the grip of New River; it is the controlling factor, for, time is long and nothing is permanent save change, even

"The hills are shadows, and they flow
From form to form, and nothing stands;
They melt like mist, the solid lands
Like clouds they shape themselves and go."

Give nature sufficient time and she will produce many extreme features. The alteration of an old land surface to a topography such as forms Giles County today has been one of gradual change. The history of your front, back and side yards is a subject more interesting than the geologic story of the Colorado Plateau, the Scottish Highlands or the Alps. Your own river is one of the oldest rivers on the North American continent. It is yours to observe; to study, and to love.

We will now consider the general history of the area and through it discuss some of the problems of geology. But first, the author wishes to thank all those who have aided him in his study of the region and guided him in the work. He will not give reference to materials already published, since it is his aim to keep away from a technical presentation of the subject. The illustrations presented with this discussion are all his work except those specially designated. It must be remembered while reading the following pages, that the author feels that "mountains are the beginning and end of all natural scenery" and Giles County is a garden spot of natural scenery.

LAND OF THE LIGHT BLUE HAZE

Let us now concern ourselves with the fascinating story of the history of New River and its tributaries. Through this history it will be necessary to insert sentences and paragraphs of explanation to clarify geologic terms and interpretations.

Many, many millions of years ago, possibly over a hundred million or more this mountainous area did not look like it does today. We have every reason to believe that for hundreds of miles in every direction the land area was a very level plain with a few moderately high knobs and ridges showing above that plain. This old plain stood just a little above sea level, and probably compared favorably with parts of the coastal plain in eastern Virginia and North Carolina today. Highlands in the Blue Ridge area formed the dividing line between the eastern and western slopes then as now.

At that time New River was a very old stream which probably formed many loops and turns (theseare called meanders) along its course as it flowed sluggishly over the level plain. It undoubtedly was very similar to the lower course of the Mississippi River today. Its source was undoubtedly in the higher lands probably in the area represented by White Top and Mount Rogers today. From its source, it flowed in a general northerly direction, but due to its meanders cut across the area now represented by Giles County. Other streams and other rivers now gone flowed across this great plain in other directions.

Two large tributaries flowed into New River from the west during that time. These joined the main river some place in West Virginia. The westernmost of these tributaries had its source in the highlands of

Tazwell and the western part of Bland counties, possibly the area now represented by Burks Garden. This river apparently flowed in a northeasterly direction crossing East River Mt. at Shumate Gap. The other tributary probably had its source in Draper Mt. area, flowed across the area represented by Bland County and crossed East River Mt. at Honakers Gap. Two large tributaries flowed into New River from the east. The lower tributary and probably the larger had its source in the highlands towards the northeast, flowed in a general southwesterly direction, crossed Peters Mt. at Dickinsons Gap and joined the main stream some place in West Virginia. The upper tributary probably had its source in the general region of Roanoke Mt. flowed in a southwesterly direction crossing Brush and Gap mountains at the wind gaps through which the state highways passes and joined New River some place in Giles County. Sinking Creek may be a remnant of this old stream. It can be seen that the pattern made by New River and its tributaries at that time was like a tree, New River forming the trunk and the tributaries the branches. This is called a dendritic drainage system. Dendritic comes from a Greek word meaning a tree.

The Summit Peneplain. A peneplain is a very old land surface with slight topographic relief. It is almost a plain which is covered with a mantle of soil. The description of the early wide-spread plain in this region makes it a peneplain.

Time passed and the entire region from Maryland to Tennessee was raised slowly above sea level. The area in Ohio, Indiana and Kentucky was not raised materially. As a result of this difference in elevation, the New River system took on new life, i. e. became young again. Due to the increased slope of the beds of the streams, ~~the water~~

the water flowed more rapidly, and bit by bit the old soils which had accumulated on the old peneplain were carried away. Still more slowly the underlying rock was decomposed by the action of water, air, frost, heat and cold, plant roots and animals, and the loosened fragments and particles were carried downward towards the sea. The softer less resistant rocks gave way to the disintegrating forces readily then as now, and left the harder resistant rocks to form the highlands and ridges, thus, the result of the work of the river in the geologic past was the beginning of the present mountain and valley features which we see today. And, today the same work is going on in the same region, in the same manner and by the same river.

All that is left of the Summit Peneplain is the shadow of its past, just remnants pepresented by the even crests of East River, Peters, Wolf Creek, Brushy, Walker, Gap, Sinking Creek, Spruce Run and Johns Creek mountains. See Plates II, III-B, V-A, VII-A, VIII-B and X-A. From the higher points in Giles County one can see the even crests of several mountain ranges towards the southeast all at the same elevation as those just indicated. Thus this local area is merely a part of a greater whole.

The Valley Peneplain. After the elevation of the land following the development of the Summit Peneplain, the region remained stationary for a long time before it was raised again. Each time the area remained quiet, New River carved out the soft rocks and developed a level plain between the resistant mountain ranges. Again and again the surface of Giles County was lifted bodily upwards, and again and again the river planed down the valleys. The process was merely one of vertical uplift, quiet stage, stream scour, planation of the valleys and then another vertical uplift. Six distinct times in all has this process been repeated.

This story is illustrated by the rock terraces on the west side of New River at The Narrows. See Plate IV-A The later and lower distinct river terraces occur in the plateau section along the same river below Glenlyn. See Plate IV-B.

The intermediary stages between the Summit Peneplain and the present elevation are not well exhibited. The rock terraces at The Narrows probably represent some of these levels, but their definite correlation to adjacent areas has not been determined.

After the Summit Peneplain had been raised about 1400 feet above the then existing sea, there was a long period of stability where the land mass remained in one position. At this time the streams again planed down the surface of the softer rocks leaving only the more resistant harder rocks as mountains. New River which had early been caught in The Narrows, The Gap, at Goodwins Ferry and between Angels Rest and Butt Mt. was held in these pivotal positions where it has remained ever since. In the interlocked portions of its course, the river wandered back and forth between the resistant rock members of the area and carved out the valleys now represented in the county. Outside of Giles County New River formed the distinct level plain in Montgomery and Pulaski counties and the level crest of the plateau area in Mercer and Monroe counties in West Virginia. Thus throughout all this region another widespread peneplain was developed. This is known as the Valley Peneplain. Due to subsequent uplift, the present elevation of this peneplain is about 2200 feet above sea level. See Plates II, III, IV, V, VI, VII-A, IX-A, and X-A.

The last great uplift of the region. In comparatively recent times the region was uplifted again to a higher elevation than it had been

previously. This was the last great uplift. New River and its tributaries were made young once more. This situation exists until this day. The upraise was so rapid that the old meandering streams which flowed across the Valley Peneplain did not leave their channel. These streams have carved deep channels in the bed rock and are now entrenched in their course. The evidence sustaining this thought is supported by the character of the meanders of New River near Norcross (See Plate VI-A), the entrenched meanders of Sinking Creek north of Newport, and the entrenched meanders of Walker Creek between Poplar Hill and Bland County. See Plate I . It is further supported by the character of the modified entrenched meanders of New River between Eggleston and Pembroke. See Plate VI-B. At this point the river has cut a channel over 500 feet below the surface of the Valley Peneplain.

Today New River is attempting again to reduce Giles County and the surrounding regions to a low level plain. The countless ages it will take to accomplish such a gigantic task is a matter of conjecture. And, the ultimate success will be of little concern to man. New River in the past has not had an easy time; it has labored hard during the countless ages since its inception. It has not only been forced to carry all of the rocks represented by the depressions below the Summit Peneplain through The Narrows, but it has had the great task of carving deep nitches in the hard resistant rocks of the border mountain ranges. So, its history is manifest in every direction in this area.

As the subject increases in interest when one lifts with difficulty the drapings of primeval obscurity that developed the first inquiries into the occurrence of life, thus revealing the secrets of bygone ages, so it is more alluring to trace the behavior and history

of a sage and mighty river. Today, one frequently stands in awe on its banks and observes, scattered everywhere about him the gravels and boulders of the old and ancient stream. He who stops to reflect and ponder over the thought which steals into his inner consciousness knows full well that history is now repeating itself. Had man been present at its inception, he could have added little to its direction. What changes he may have made would have been transitory, for ultimately neither man nor God could alter its course without disturbing the terrain over which it has wandered throughout these countless ages. Today, we see an amber stream entwined among the mountain fastnesses of a glorious land, full of youth and vigor, working as hard as it did during the time when the land was raised high above the sea, and long after it had softened the bleak forgotten peaks of another age to the monotonous plain represented by the crests of the present mountain ranges. This is New River.

COUNTRY ROCKS

All of the rocks of Giles County belong to one class, i. e. they are sedimentary. They consist of conglomerate, sandstone, shale, limestone and dolomite. A volcanic ash occurs in the upper member of the limestone and dolomite series and constitutes the only material of igneous origin.

Sedimentary rocks. If you will go to New River or its tributaries you will find that after a flood sand bars have been formed. In some places islands have developed in the channel of the

river. The material which makes up the bar and island is composed of boulders, gravels, both coarse and fine, sands and lastly very fine particles or mud. All of this material was deposited by the water. Now, if all of this loose material was cemented into a compact mass it would form a solid rock. The coarse boulders and gravels would form a "pudding stone" called conglomerate, the finer sands would form a sandstone and the fine muds would form a shale. Like these, the sediments of the geologic past have been cemented and we know the rocks as conglomerate, sandstone and shale.

In Giles County there are other types of rock known as limestone and dolomite. The limestones were formed under a special condition in the geologic past. The materials which compose them were broken parts of animal shells and precipitate of lime from sea water. Most limestones have been formed in the sea. The dolomites are virtually the same as the limestones only made up of a different chemical element. For those interested in chemistry,- a pure limestone is composed of calcium carbonate while a dolomite is a calcium and magnesium carbonate.

Rocks of Giles County. The sedimentary rocks of Giles County are varied and numerous. They will be discussed in detail in a technical report to be published later. In this ~~report~~ pamphlet, necessarily brief, the rocks will be grouped under general terms. See Plate I.

The oldest rocks in the area consist of purplish red and sometimes green shales containing some limestone members. These are here called the "Old Red Shale". They occur only in one locality, at Bane, Virginia.

The "Limestone and Dolomite" group consists of a thick series of many different kinds of limestones and dolomites. The group is composed of thick and thin bedded limestones and thicker bedded and more resistant dolomites. They are widely distributed throughout the county forming the rich fertile lands characteristic of the valleys. Many of the limestone members are very soluble, i. e., the lime dissolves and is carried away by the streams. These soluble limestones form the sink holes, caves, and caverns of the area. One of the characteristics of the limestone members is the sink hole topography. This characteristic is well shown near Maybrook, Hoges Store, Pearisburg and the central section of Clover Hollow. These limestones and dolomites are quarried for lime and ballast. The culture of the county is limited in general to the distribution of this group.

Brown Shales and Limestones. Farmers are much better geologists than people ordinarily think. The brown shales form the upper rim of cultivation in the main part of the county and the farmers always clear the upper slopes when they appear. The brown shales are really a muddy blue limestone series, which on decay turns to a shale. They occur just below the rim rock and form the steep slopes near the mountain crests. The land when cleared is very good for blue grass and grains, but the slope of the field is too steep for continued cultivation. The brown shale is the country rock which forms the beautiful blue grass land of Tazewell County.

Rim Rock Sandstones. The Rim Rock Sandstones are the hardest and most resistant rocks of the entire area. They always form the crest of the mountain ranges. These sandstones are composed of four

distinct members. The lower member consists of a blocky red sandstone blotched with light green patches. Just above is a hard resistant white sandstone which can be broken only with difficulty- this member forms the falls in The Narrows. Still higher is an iron sandstone composed of many thin beds of sandstone and shale, which is a deep ox-blood red in color. The uppermost member is a white crystalline sandstone. This member forms the falls in The Gap. The Rim Rock Sandstones are suitable for just one crop, namely, forest. A few families have attempted to develop their farms on the iron sandstone member, but the soil is thin, the elevation is usually high and the cleared space very limited. The first white member of these sandstones dominates the topography of the high areas. Great blocks broken off at the rim have gradually worked down the steep slopes of the brown shales, and the rivers have carried them far out into the valleys scattering them as erratics throughout much of the county. It is the resistance of the Rim Rock Sandstones which holds up the higher mountains such as Bald Knob, Butt Mt. and Angels Rest.

Black Shale. The black shales are not well represented in Giles County. They occur only in protected areas like Little Meadows, near Kire, along the south flank of Peters and East River mountains and near the head of Dismal Creek. But just outside of the county in Montgomery and Pulaski counties the bordering valley is formed by the shales. In Montgomery County the black shale valley is properly called Poverty Hollow. The black shales are fine grained, easily broken and crumpled, and weather readily, thus they are always found

in depressions. They produce poor soils which is characteristic of the strip from New York to Alabama .

Coal-bearing Sandstones. Coal-bearing sandstones are limited to the northern tip of Giles County. They form the first major ridge along the north flank of Peters and East River mountains. Coal smut may be seen along the highway below The Narrows, but a better coal seam is exposed near Lindside, West Virginia. In Montgomery and Pulaski counties the coal seams are sufficiently developed for commercial mining.

Upper Big Limestone. These limestones are composed of different members which occur only in one part of the area, namely along New River just above Rich Creek. Several members have been quarried and used for crushed stone for road building. They form a very rich soil.

Upper Green Shale. These soft, friable, non-resistant dark colored, limy shales which weather to a red or green color, form a strip across the northern tip of Giles County including Rich Creek and Glenlyn. New River now occupies much of the area.

Top Sandstones and Shales. At the top of the series of sedimentary rocks found in Giles County is a great mass of thin bedded sandstones and shales which usually weather to a deep red color. These form the surface rock exposed along New River in the northernmost tip of the county. Further to the northwest in West Virginia they contain seams of coal. These sandstones and shales are not very resistant to the weathering agents, consequently they continually slump along the state highway between Rich Creek and Glenlyn.

EFFECTS OF DIFFERENT TYPES OF ROCKS UPON THE TOPOGRAPHY

General discussion. The erosional effects of running water over rocks of different hardness form a topographic relief of high and low lands. Ever since New River flowed across the Summit Peneplain, it has slowly, but contimually adjusted its course to the softer rocks of the area. Thus it has cut deep channels in the early Limestones and Dolomites and left the hard resistant Rim Rock Sandstones at the crest of the mountain ranges. Where the resistant rocks dipped across its channel, the river has cut a narrow nitch. The high points scattered throughout the county are a result of the difference in erosion.

Salt Pond Mt. Salt Pond Mountain forms a great arch of very resistant Rim Rock Sandstone. On the flanks of the mountain the rocks dip in opposite directions. At its western extremity, the mountain has been worn back by the action of percolating waters through the underlying soluble Brown Shales. This action merely dissolves the limestone and leaves the insoluble parts as mud.

Mountain Lake, one of the most unique features of the entire area merely occupies a large sink hole which has been clogged by the muds of the disintegrated shales thus preventing its outflow from below. Much of the limestone which is entering the waters today is being carried over the rim in solution through Pond Drain. The sink hole is so large, so deep and at such a high elevation that it forms a special feature. Mountain Lake is 110 feet deep in the deepest place. See Plate XIII-A.

The Water Gaps. The tilted Rim Rock Sandstones of East River, Peters, Walker and Gap mountains have formed a continual barrier to New River throughout all of its history since Summit Peneplain time. The rocks have stood across its path during all this time and are still the great hindering factor in its drainage system. See Plates XI-B and IX-B.

Wind Gaps. Wind gaps are formed by rivers cutting down through hard rocks, and then later being diverted from their course. When the surrounding lands are lowered by later erosion, the nitch in the mountain through which the river formerly flowed forms a wind gap. Such features are shown in Giles County in Shumate, Honakers Gap in East River Mt., Dickenson Gap on Peters Mt and the wind gap separating Gap and Sinking Creek mountains.

The Cascades. The Rim Rock Sandstones northwest of Salt Pond Mt. bend down and form a great spoon-shaped basin. The rim of the spoon is cut by Little Stony Creek. The water gathered in the basin and at Mountain Lake flows over the rim at The Cascades forming beautiful falls known as Mirror Falls. At this point the resistant lower beds of the upper white sandstone member of the Rim Rock Sandstone form the cap, and immediately below is the non-resistant shale and sandstone of the iron sandstone member. The water merely wears away the softer shale and leaves the hard resistant sandstone as a ledge above over which the water falls a distance of about seventy five feet.

Big Stony Creek. The rugged scenery along Big Stony Creek is due to the fact that the Rim Rock Sandstones have been folded and crumpled in that area, and the stream has not cut down through the resistant rock group.

Angels Rest and associated mountain scarps. Angels Rest is formed by the Rim Rock Sandstones. It consists of a wide trough sloping towards the southwest. The rivers have cut away the resistant rock over Pearisburg and taken away the softer rocks below and left the tip of the trough high above the valley forming a sharp scarp. See Plate VI-A. The sides of this structure possess the same character along the entire mass. See Plates II-A, V-B and VIII-B.

High Points. The high points including Bald Knob on Salt Pond Mt., High Knob on East River Mt., High Point and Dismal Point on Sugar Run Mt., Look-Off Rock on Butt Mt., and Kellys Knob are merely erosional remnants. In each instance the Rim Rock Sandstones flatten out forming a wide resistant flat area at the crest. Naturally such a condition does not offer itself readily to erosion, and the platform is left above the valley floor as a prominent feature.

There are a great many lower points along the crests of the major mountain ranges which overlook the valleys. These points are merely the higher parts of the upturned edges of the rim rock.

Barneys Wall is merely the vertical section exposed across the reasonably flat lying Rim Rock Sandstone, where the Brown Shale and limestone have eroded away below. This cliff is a few hundred feet high.

Geologically, these high points are of very great age. Probably all of them formed the highest elevation of the area more

than a hundred million years ago when the Summit Peneplain was a lowland near sea level. Of course, some of the younger rocks which originally covered them have since been carried away, but their position was then essentially as it is now. The very fact that on all of these high points the rocks are essentially the same and the surface condition at each place very similar, indicates that they have withstood the ravages of weathering agents through a long period of time.

Rock Sculpture in the Valley Peneplain. Rock sculpture in the Valley Peneplain has been of two kinds, i. e., stream scour and solution. The former is typified by the work of New River and its tributaries as explained in preceding paragraphs. These streams have not only cut deep gorges, but have also rounded the hills and made a very irregular rolling surface. Here and there the higher hills are capped by stream boulders and river gravels. See Plate VII-B. This, added to the influence of solution forming sink holes, has left a very pitted and irregular surface. Where New River has cut deep into the Valley Peneplain, perpendicular cliffs have been left. See Plate XI-A. These are well developed between Eggleston and Pembroke. Castle Rock at Pembroke is very typical of this feature.

At Pembroke, New River once flowed in the depression now occupied by the High School and the main business section. Later it cut off the meander and abandoned the old channel. More recently Little Stony Creek and Doe Creek have filled in the old channel forming a large U-shaped alluvial fan. The junction of the two fans follows in general the highway in the upper part of the village.

a metal which is coming into general use and taking the place of aluminum is widely distributed throughout the county. Some dolomites along the railroad carry over 45% magnesium carbonate. There is an unlimited supply of this rock.

The principal natural resource of the area consists of the reduction of limestone to lime and quarrying of the dolomites for crushed rock. The limestone highly suitable for reduction can be traced into most parts of the county. It is a dense, vitreous stone which weathers to a light dove color. In many places a very dark gray crystalline limestone is immediately above. Such an association forms a good quarry site.

High grade marble occurs in many parts of the county. This stone is highly suitable for building material.(Virginia Geological Bulletin 40).

The future development of the mineral resources of the county will depend primarily on the economic situation in the nation. The iron ore will not be used until cheaper iron ore elsewhere is exhausted. The same is true of all other ~~minerals~~ metals. In reference to the limestones, there should be a growing demand for high grade limes. The stone now used for crushed rock has its limitation in construction, unless the demand for magnesium increases. In that case the rock can be used for the recovery of that metal.

Coal. There is no commercial coal in Giles County. The black shale which occurs in a few parts is no indication of coal. A thin seam might be found in the coal-bearing sandstone in the northern part of the county, but it would have very little value.

Sand and Gravel. The islands in New River can be used for the recovery of sand and gravel. One or two plants operated for several years. Competition with crushed rock is keen and at present these plants are not operating.

Parks and Pleasure Resorts. So much can be placed under this heading that there is no limit to the descriptive matter. It is safe to say that at every turn in the road and from every hill and mountain point throughout the entire area one can see a beautiful picture. One might consider Giles County in its entirety as a great natural park with all the lure of those much heralded in other parts of ~~the world~~ America. The scenery is different from the rugged grandeur of the Rocky Mountains, the awe-inspiring depths of the Colorado River, the brilliant remnants of the old lands of the Colorado Plateau, the scintillating beauty of the Yellowstone or the droll weirdness of the Columbia River plateau. The width and depths of valleys, with the undulating surface of the Valley Peneplain, distant mountain points, knobs and nitches, and the ever present light blue haze makes locations for restful outing camps, summer hotels and pleasure resorts on the rim of the valley. In the not too distant future high rim points other than Mountain Lake will also be developed and made use of as summer resorts.

When the Rim Rock Sandstone area has been covered again with white pine and other desirable trees the area should form a lure for sportsmen. Fishing and hunting should attract many

people from the lower valley states.

The valley section of the county is suitable for the development of country estates. The high rounded hills of the Valley Peneplain are almost perfect sites for country homes, and the space surrounding each affords ample opportunity for landscaping.

Scientific Interest. There is probably no section of equal area any place in America which presents a better laboratory for geological study than the New River from Radford, Va. to Hinton, West Virginia. Nearly four miles of sedimentary rocks are represented in the area, and rock series over two miles in thickness have been turned up so that the highways cut across the upturned edges.

Interest in the plant and animal life of the region is manifested by the establishment of the Biological Station at Mountain Lake by the University of Virginia. The people of the state should be proud of this station located on the Rim Rock Sandstone in the heart of the oldest topographic feature in the area, i.e., the Salt Pond Mt. monadnock which formed the highlands above the Summit Peneplain probably over one hundred million years ago. See Plates III-A, VI-B, XII-B, XIII-A and XVI.

"So near shall be my garden, that all who are weary may come and rest; so enchanting its spell that none may go away unrefreshed."

Not far from the Biological Station one may find fossil remains of animals buried in the iron sandstone member. They represent the life of another age. Throughout the greater part of

the county, rocks contain fossil evidence of animals that lived ~~at~~ during successive geological periods. Many excellent specimens may be obtained where part of the limestones have turned to a flint. Among the oldest animal remains preserved in this area are snails. See Plate XIIL-B These ~~large~~ animals formed a shell which coiled in the opposite direction from that of the snails of today. By a study of all the fossils that are embedded in the rocks of the region, one can get a very good concept of the development of life.

" A fire-mist and a planet,
A crystal and a cell,
A jellyfish and a saurian,
And caves where the cavemen dwell;
Then a sense of law and beauty,
And a face turned from the clod-
Some call it Evolution,
And others call it God."
-Carruth-

The animal remains which are included in the rocks indicate that the animal lived in a sea. This evidence does not mean that the ocean was at one time over Giles County. It means that when the sediments forming the rocks were laid down, the position was below sea level. These sediments were later cemented into rocks. At a much later time the rocks were folded, faulted and raised above the ocean level to the present position.

CONCLUSION

The New River valley offers to all those who pass through an opportunity for speculation as to its existance; to those who come to stay, a livelihood; to those who come to study, exploration of its history; to those born within its fold, a home, and to those who have seen yet wandered to fields afar, a longing to return.

I've knocked about a bit
  In this glorious land of ours,
I've treked the sandy wastes
  And plucked the desert flowers.

I've trailed the hot Mohave
  And skeed the Kaibab snow,
To gaze at the Colorado
  In the canyon far below.

I've stood upon the brink
  Of Yellowstone's sculptured hall,
That heads the Mississippi,
  The mightiest of them all.

I've paddled down the Columbia
  In an Indian fir canoe;
I've seen the treacherous Humbolt
  Raise, grow large and go eschew.

But when comparing rivers and
  Their work through all the miles,
First honor goes to New River
  The one that sculptured Giles.

- A. A. L. M.

PLATE I

GEOLOGIC MAP OF GILES COUNTY

PLATE II

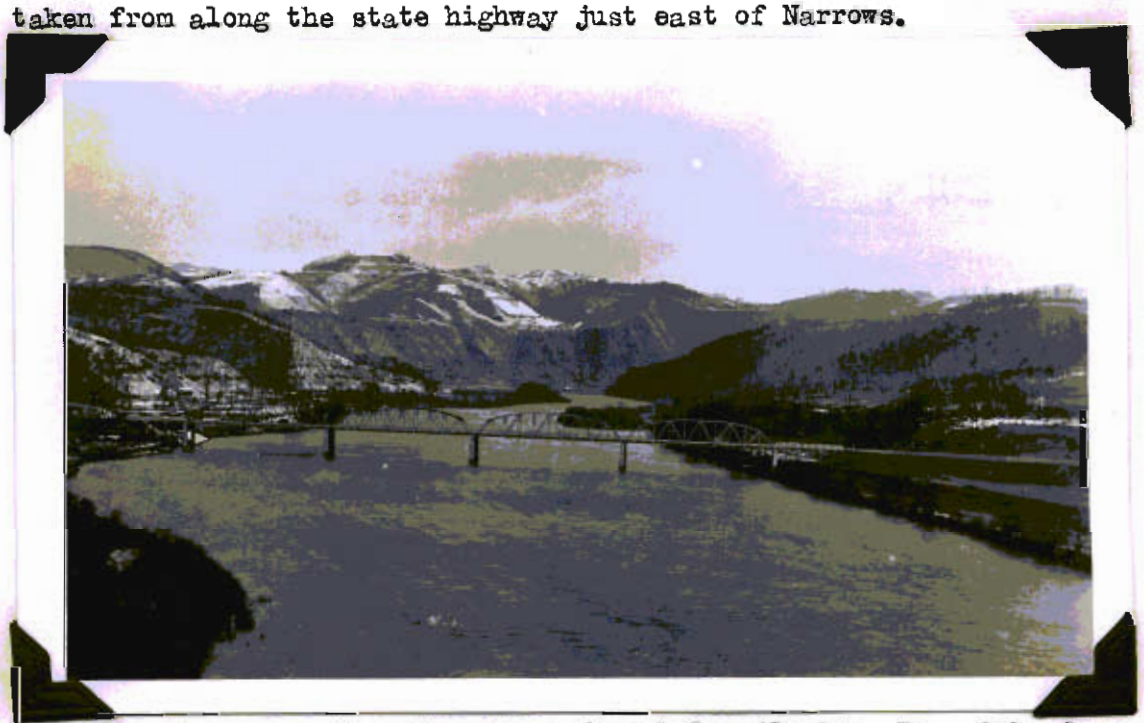
A- New River valley from a point along the Mountain Lake Road on Salt Pond Mt. The Summit peneplain is represented by the even crests of Walker, Spruce Run and Sugar Run mountains. The dissected Valley Peneplain is represented by the lower level. New River channel is indicated by the fog bank at the right center. It was at this point that Pollard wrote his famous description of New River about 1864.

B- The Summit Peneplain as shown from a position on Johns Creek Mt. looking towards the southeast across the even crests of Spruce Run, Sinking Creek, Brush and Roanoke mountains with the Blue Ridge in the extreme background. The Valley Peneplain shows in the immediate foreground forming the fertile limestone valley of Clover Hollow.

A- The great monadnock above the Summit Peneplain. The high point to the right is Bald Knob, which is the highest point in the entire area. Butt Mt. in the middle center is only a few feet lower. The Summit Peneplain is indicated by the even crest of Peters Mt. in the distance. Photograph from Gap Mt. along the highway near Wind Gap.

B - Summit Peneplain as indicated by East River and Peters mpuntains in the background. The nitch towards the left is The Narrows. The level plain in the foreground is the Valley Peneplain and represents the surface of the plateau area in the northern tip of Giles County and adjacent parts of West Virginia. Photograph from east end of Bent Mt. near Athens, West Virginia.

A - The Narrows of New River just below Narrows, Va. The Summit Peneplain is represented by the even crests of East River and Peters mountains and the Valley Peneplain is indicated by the lower hills through the gorge. New River cut the rock terraces into the end of East River Mt. and has lowered itself to its present position by successive stages. These terraces have been carved out of the hardest type of sedimentary rock. Photograph taken from along the state highway just east of Narrows.

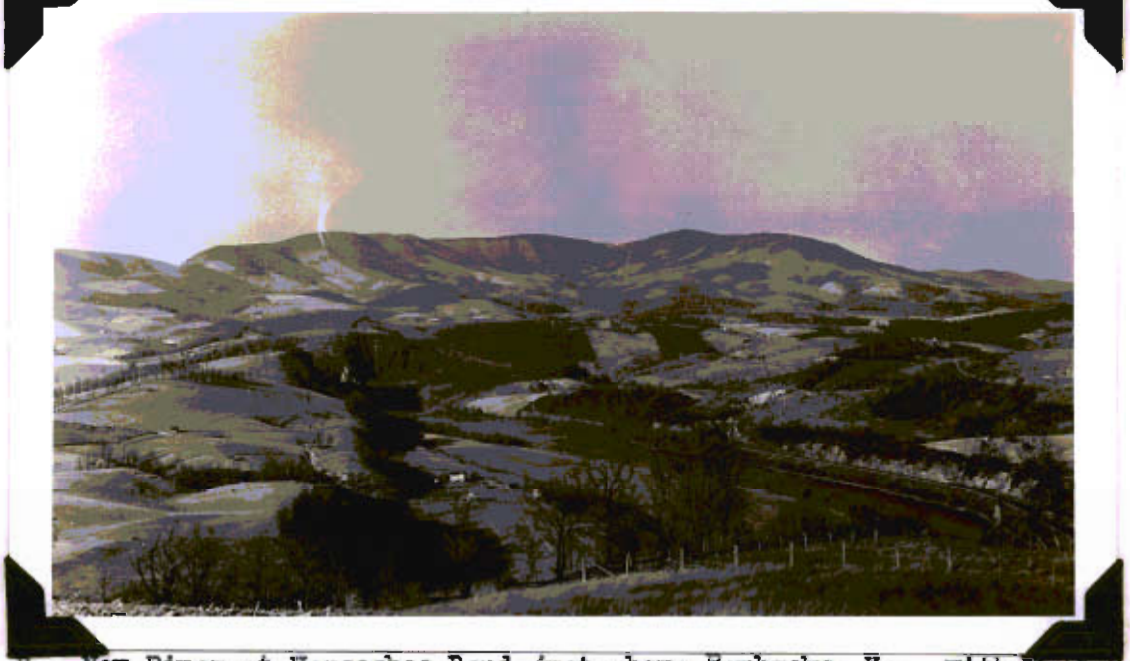


B - River terraces along New River just below Glenlyn, Va. Only four terraces present. The uppermost terraces have been eroded away. The river has cut down rapidly from the Valley Peneplain as indicated by its steep west bank. Photograph taken from the Virginia Railroad bridge just above Glenlyn.

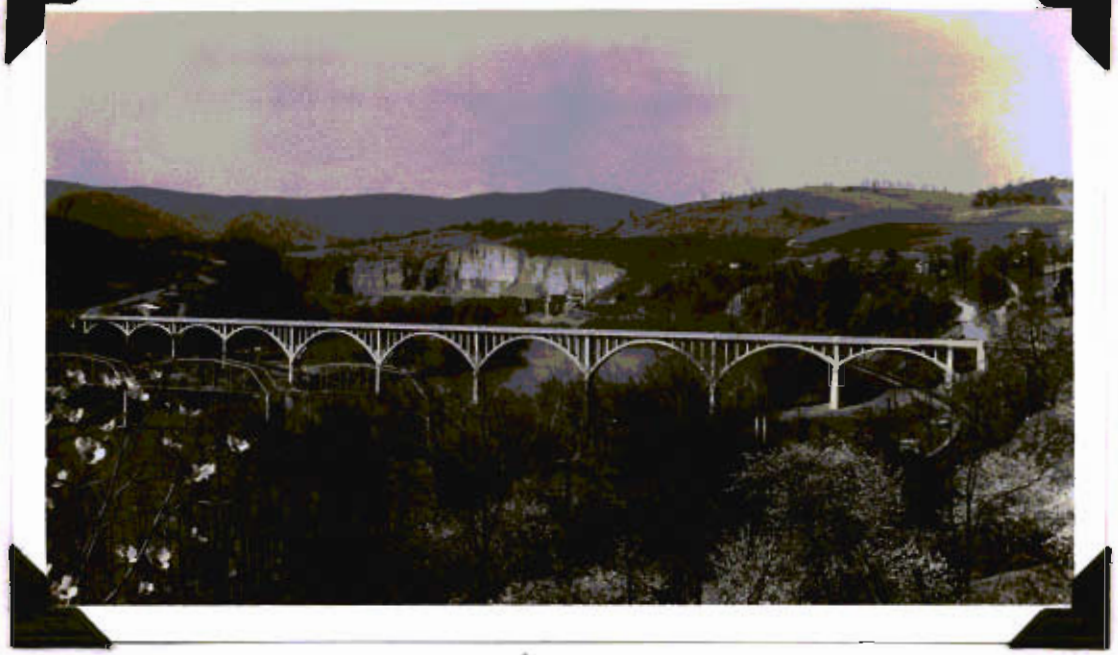
A - The Valley Peneplain with the even crest of Walker Mt. in the background. This peneplain has been definitely alterd by Walker Creek which flows in the immediate foreground. The cultivated fields of the middle ground constitutes a slip-off slope of the great bend in Walker Creek. The fertile soil is due to limestones and dolomites. Photograph from the north bank of Walker Creek looking across Broad Hollow.

B - Looking across the dissected upper surface of the Valley Peneplain towards High Point. The fertile fields in the foreground are due to the limestones and dolomites. These rocks constitute the fertile valleys throughout the entire county. Photograph from the north side of Walker Creek looking towards High Point across Sugar Run valley.

A - New River just below Klotz, Va. with Angels Rest in the background. The curves in the river today are the same shape as they were when the river flowed across the Valley Peneplain. They are entrenched meanders. It can be seen that the river has cut down rapidly into the solid rock. This channel forms a natural right-of-way for the two railroads which traverse Giles County. Photograph from the highway above the Virginia Limestone Company.



B - New River at Horseshoe Bend just above Pembroke, Va. with Salt Pond Mt. in the background. Here the meanders are modified from their initial position on the Valley Peneplain. The nitch in the central background gives the location of Mountain Lake. Photograph from west Bank of New River near Mountain View.



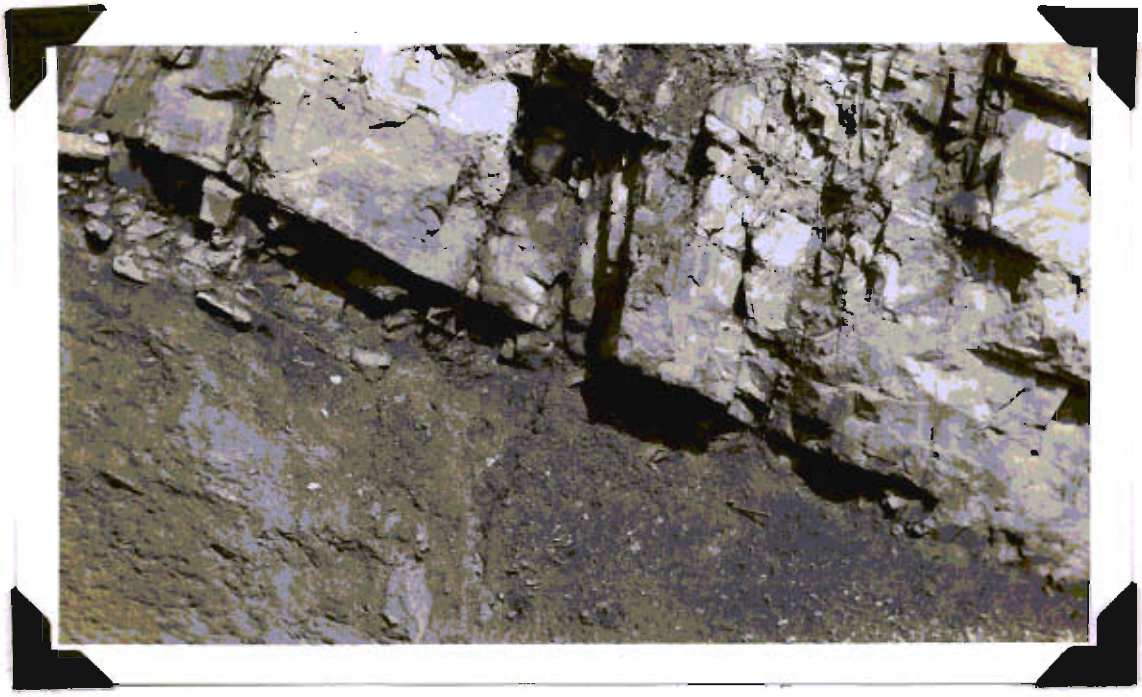
A - New River at Ripplemead, Va. with Peters Mt. in the background. Its even crest indicates the Summit Peneplain while the foreground is a remnant of the Valley Peneplain. The Virginia Limestone Company's quarry in the background is situated in the limestone and dolomite series of the area. A quarry located near Pembroke furnished the material for the construction of the new bridge. At this point, New River has eroded down to a very soluble and cavernous limestone member on which the piers of the new bridge were placed.

B - The level below the Valley Peneplain near Pembroke, Va. The fields are covered with river boulders which were left on the surface when the river formed the level. The wide fence was built from these boulders. New River now occupies a gorge 300 feet below this surface.

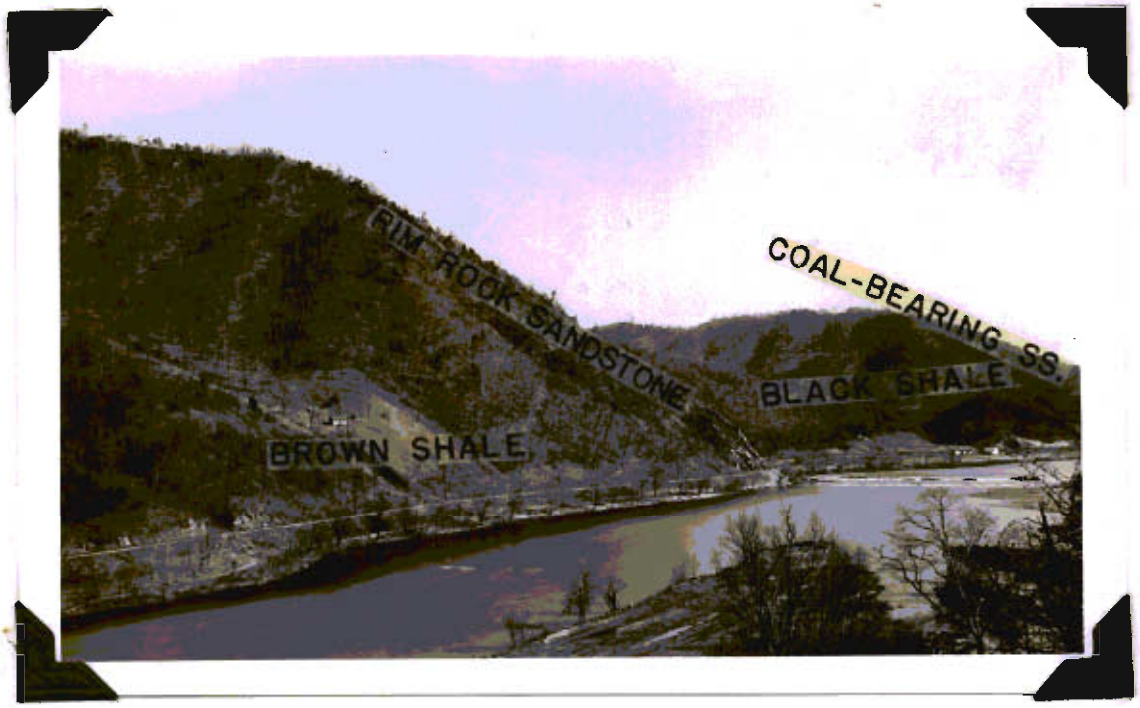
PLATE VIII

A - An alluvial fan near Bluff City, Va. This is a characteristic feature of the sedimentary processes which gradually fills up valleys. This fan has completely filled in across the abandoned channel of New River.

B - Another type of alluvial deposit similar to an alluvial fan. This was formed by a torrential mud flow probably since the white man has inhabited Wolf Creek valley. It was caused by a cloudburst along East River Mt. Under such conditions water, soil, rocks and trees move downward as a mass of thick molasses. This is the largest single feature of this type in Giles County. The trees in the background indicate the Valley Peneplain and the even crest of Wolf Creek Mt. that of the Summit Peneplain. Photograph from along the highway above Penvir, Va., looking towards Sentinal Pt.



A - The St. Clair fault exposed along the highway in The Narrows. The thick massive dolomites above have been shoved up and over the very much younger black crumpled shales below. The shale is probably 200,000,000 years younger than the dolomite. This fault has been traced laterally for a great distance.



B - New River at The Gap where it enters Giles County. Here the Rim Rock sandstone is tilted towards the southeast. The sandstone outcrops completely across the river, thus forming the falls. Similar condition and the same Rim Rock sandstone forms the falls in The Narrows. The soft, non-resistant shales are eroded away on both sides of the sandstone. Photograph from west bank of the river just above Berton, Va.

A - Clover Hollow near Newport, Va. This very fertile horseshoe-shaped valley is surrounded by Rim Rock sandstone which dips away from the central part of the valley. This type valley is known as a pitching anticline. The even crests of Spruce Run and Sinking Creek mountains represent the Summit Peneplain, and the higher elevation, Kellys Knob (Turkeys Breast) to the left formed a monadnock above that plain. Photograph from crest of Johns Creek Mt.

B - Crumpled and folded rock along the road leading to Clover Hollow from Newport, Va. This section forms one of the best example of rock folding in the entire area. Photo by W. O. Bond.

A - Cliffs along New River between Eggleston and Pembroke, Virginia. In this section the river has entrenched itself in the solid limestones and dolomites which form the fertile soils of Giles County. Note the vertical cliffs and the master joints which in time will develop chimney rocks. Photograph from top of cliff just below Eggleston by Ward O. Mathews.

B - The Rim Rock sandstone forming the Falls in The Narrows. This sandstone is a great barrier to the down cutting of the river and also to river transportation. Photograph from the east side of the river.

A Springs are very common throughout Giles County. Some of them are very large. The springs below the Valley Peneplain furnish hard water, while those at the base of the Rim Rock sandstones furnish "free stone" water. This spring is along Walker Creek at Broad Hollow. The photograph was taken in August when the water was at its lowest.

B Good "free stone" water and a wide expanse of Rim Rock sandstones have made it possible to establish the Mountain Lake Biological Station on Salt Pond Mt., about two miles from Mountain Lake hotel. This botonical garden consists of many thousand acres. Hon. George Peery, Governor of Virginia and Doctor Ivy Lewis, Director of the Experiment Station stand near the center of the picture.

A Mountain Lake with Bald Knob in the background. This unique body of water is situated at an altitude of 3873 feet above sea level in the heart of the highest monadnock in the area. Soundings have been made of the entire lake. The deepest hole is in the immediate foreground. It is over 100 feet deep.

B Snails possibly a half billion years old. Giles County offers a great laboratory for scientific study. Many slabs of rock scattered in every part of the county contain the remains of animals. This slab was found just east of Narrows, Va. It is now in the United States National Museum.

Forest along Dismal Creek. This forest is probably the last virgin timber in Giles County. The size of the white pine is indicated by the man at its base. These trees are growing on the Rim Rock sandstone which is highly suitable for re-forestation. Much of Giles County should be re-forested with white pine.

PLATE XV

Plants frequently grow in peculiar places. This tree shows the power that a growing root or stem has on solid rock. Photograph near Kerns, Va. along the Big Stony Creek road.

A - Salt Pond Mt. including Big Mt. showing the extent of the high monadnock. Bald Knob is the high point in the left background. Photograph from the Summit Peneplain on Peters Mt. looking south over Big Stony Creek. This entire area forms a botanical garden.

B - Photograph taken near the crest of the Salt Pond monadnock. Butt Mt. in the left background. The steep slope in the left center is Barneys Wall. This forms a part of the botanical garden.