



**EXPLANATION**

**Quaternary**

**Holocene**

Qal  
Qar  
**Alluvium**  
Deposits along stream channels. In some places includes parts of lowermost terrace  
Qal, stream alluvium  
Qar, river alluvium

**Pleistocene**

Qt  
Qtr  
**Terrace deposits**  
Alluvial deposits on several terrace levels  
Qt, stream terrace deposits  
Qtr, river terrace deposits

**UNCONFORMITY**

**Des Moines**

**Krebs Group**

Ps  
Pss  
**Savanna Formation**  
Alternating units of predominant shale or predominant sandstone  
Ps, shale, siltstone, and thin beds of sandstone  
Pss, sandstone, silty sandstone, or interbedded sandstone, siltstone, and shale

Pm  
Pms  
**McAlester Formation**  
Alternating units of predominant shale or predominant sandstone  
Pm, shale, siltstone, and thin beds of sandstone  
Pms, sandstone, silty sandstone, or interbedded sandstone, siltstone, and shale

Ph  
Phs  
**Hartshorne Sandstone**  
Predominantly sandstone but with intercalated shale and siltstone in some places  
Ph, shale, siltstone, and thin beds of sandstone  
Phs, sandstone, silty sandstone, or interbedded sandstone, siltstone, and shale

**Atoka**

Pa  
Pas  
Pasc  
**Atoka Formation**  
Alternating units of predominant shale or predominant sandstone  
Pa, shale, siltstone, and thin beds of sandstone  
Pas, sandstone, silty sandstone, or interbedded sandstone, siltstone, and shale  
Pasc, sandstone unit C; sandstone, silty sandstone, or interbedded sandstone, siltstone, and shale

**PENNSYLVANIAN**

**CARBONIFEROUS**

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Contact  
Dashed where approximately located

50' D U  
Fault, showing dip  
Dashed where approximately located; dotted where concealed.  
U, upthrown side; D, downthrown side

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Anticline  
Showing crestline. Dotted where concealed

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Syncline  
Showing troughline. Dotted where concealed

Inclined Horizontal  
Strike and dip of beds

Symbols shown in areas of alluvial deposits were measured on bedrock exposures too small to be shown on this map

Inclined Vertical Horizontal  
Strike and dip of joints

←  
Direction of flow of Pennsylvanian depositional current  
Based on measurements of dips of crossbedding and orientation of ripple marks in sedimentary rocks

◇  
Shale sample locality

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Coal bed  
Dashed where approximately located

x10  
Exposure of coal bed  
Number is thickness of coal, in inches

x12  
Surface opening to coal bed  
Number is thickness of coal, in inches

166  
Shallow hole  
Number designates hole listed in table 3 in text

x  
Strip mine or quarry

x  
Gravel or shale pit

X-----X  
Line of structural section shown on plate 3

D-----  
Measured stratigraphic section shown on plate 2

☆38  
Gas producing

☆46  
Show of gas

◇6  
No show of gas

Wells  
Number designates well described in table 2 in text

Base from U.S. Geological Survey, 1:24,000, 1962  
10,000-foot grid based on Arkansas coordinate system, north zone

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D.C.—1971—G70172  
Geology by E. A. Merewether, 1958-60

**GEOLOGIC MAP OF KNOXVILLE AND DELAWARE QUADRANGLES,  
JOHNSON AND LOGAN COUNTIES AND VICINITY, ARKANSAS**

